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REPORT

OF THE

SUDAN MEDICAL SERVICE

FOR THE YEAR

1939

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SUDAN MEDICAL SERVICE.

ANNUAL REPORT 1939.

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ANNUAL REPORT
OF THE SUDAN MEDICAL SERVICE
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GENERAL HEALTH.

The state of public health in the Sudan remained satisfactory during the year. Although relapsing fever and smallpox occurred sporadically in several provinces it was possible to prevent epidemic spread. An extensive epidemic of cerebro-spinal meningitis occurred in Equatoria Province but new methods of treatment reduced the mortality dramatically. A severe epidemic of measles in Equatoria Province caused a heavy mortality among children. The malaria incidence in the Northern Sudan was below that of last year as a result of the low Nile flood and well spaced rains.

HEALTH OF OFFICIALS.

NATIONALITY.	Number of officials employed	Total		Average days Sickness		Died	Invalided.
		Placed on sick list	No. of days sick	For all officials	For those who were sick		
British	886	218	1,727	1.95	7.92	1	4
Sudanese	3,324	726	6,275	1.88	8.64	7	13
Egyptian	521	92	904	1.73	9.82	5	3

The comparative figures for the last five years are as follows :—

	1935	1936	1937	1938	1939
BRITISH.					
Days Sickness	1.32	1.56	1.15	2.22	1.95
Died	1	2	1	1	1
Invalided	3	2	1	2	4
SUDANESE.					
Days Sickness	1.42	1.48	1.58	2.57	1.88
Died	5	14	6	6	7
Invalided	13	4	11	8	13
EGYPTIANS.					
Days Sickness	1.17	1.66	1.34	1.91	1.73
Died	3	4	—	1	5
Invalided	1	2	8	3	3

PROGRESS OF WORK.

The curative work carried out at hospitals and dispensaries shows a slight increase despite the temporary reduction in work of a few hospitals owing to measures taken on the outbreak of war. Although a building programme is at present being carried out in certain areas to complete as far as possible hospital accommodation, it is likely that, taking the Sudan as a whole, the work will now remain stabilised at about the present figures, varying from year to year with the state of public health. The development of preventive medicine continues as rapidly as possible, and a marked improvement is being effected in sanitation in all areas. Water supplies, conservancy and anti-malarial work are improving yearly, and special attention is being paid to milk and vegetable supplies. School medical work is completely organised and a whole time qualified official is now employed on this work in Khartoum. Special attention is being paid to child welfare in the towns and a school dental service has been organised in Khartoum. The Graphic Museum will soon be fully equipped and is proving an indispensable addition to the public health and teaching services. The results of the propaganda of public health among the general population, particularly sheikhs and notables, are now being seen in rural areas. The rapid improvement in the situation as regards malaria in the Dongola district of Northern Province is largely due to the willing co-operation and initiative of the local notables and farmers.

EPIDEMIC DISEASES.

At the beginning of the year cases of smallpox were reported in Western Darfur from French Equatorial Africa, and it appeared likely that this very susceptible province would be attacked by one of those severe epidemics which occurred periodically in the past. Accordingly arrangements were made to vaccinate the whole population of the Province as far as possible, and 349,090 vaccinations and re-vaccinations were carried out during the year. In all 502 cases with 98 deaths were reported, and it is significant that in one district which had escaped vaccination temporarily 65 cases were reported as the first indication that the area had become infected. Thanks to the potency of the calf lymph, the energy of the vaccinators and the willing assistance of the native administrations and province staff the disease was controlled and the anticipated epidemic was avoided. A few sporadic cases were reported in the Eastern Sudan infected from Italian East Africa.

Throughout the year relapsing fever occurred sporadically in Kassala, Blue Nile, Kordofan and Darfur Provinces, and much additional work resulted for the public health staff in quarantining villages, and in extensive delousing campaigns. This disease must be dealt with at once and facilities for treatment made available to avoid extensive outbreaks and loss of life.

An extensive epidemic of cerebrospinal meningitis occurred in the Rumbek and Tonj districts of Equatoria Province. 2,602 cases occurred with 606 deaths. Treatment with drugs of the Sulphonamide group was remarkably successful and has altered the whole picture as regards the case mortality from this disease in the Sudan.

ENDEMIC DISEASES.

The incidence of Bilharziasis remains negligible except in the Juba district of Equatoria Province where the incidence increased probably due to temporary causes. The incidence and distribution of Kala-Azar and Leprosy remains the same. Malaria has been less prevalent in the Northern Sudan than in 1938 owing to a better spaced rainfall and a lower high water level of the river. Sleeping Sickness remains mildly endemic in Equatoria Province in the Zande District, and a few sporadic cases were reported from the Kajo Kaji District. Systematic fly destruction is being carried out over a wide area and it is hoped that it will be possible to assess the value of this preventive measure in the near future.

QUARANTINE.

5,523 pilgrims left the Sudan for Jeddah and were vaccinated and inoculated with calf lymph and cholera vaccine made at the Stack Laboratories. The period of quarantine for returning pilgrims was 24 hours.

297 Egyptian labourers were admitted to Wadi Halfa Quarantine of whom 24 were treated for bilharziasis either at Wadi Halfa or their destination.

TRAINING.

15 students were under training at the Medical School during the year, and the usual training courses were held for public health officers, dispensers, sanitary overseers, female nurses, midwives, laboratory assistants, medical assistants and hospital orderlies. Two candidates were successful in obtaining the diploma of the Royal Sanitary Institute. Two Sudanese medical officers completed a three months post graduate course in London during the year and four medical officers commenced a six months post graduate course in Khartoum in October.

STACK MEDICAL RESEARCH LABORATORIES.

Routine Work. 24,540 routine examinations were carried out compared with 22,633 in 1938, 20,432 in 1937, and 18,041 in 1936, despite the policy of decentralising as much routine work as possible to provincial hospital laboratories. In particular five provincial laboratories were carrying out Kahn tests for syphilis locally compared with one in 1938. Despite this the increase in the number of routine examinations carried out in the Central Laboratories is chiefly accounted for by a large number of Kahn tests and Widal reactions. On the outbreak of war much extra work in blood typing of volunteers and preparation of blood transfusion apparatus was thrown on the laboratory staff. 188 routine bacteriological examinations of water were carried out and the following quantities of vaccines were issued during the year :—

Cholera	7,750	ccms.
Gonococcus	2,000	,,
Anti-Rabic	51,060	,,
T.A.B	7,300	,,
Staphylococcus Aureus	1,300	,,
Vaccine lymph	984,000	doses.

193 Biochemical tests were carried out compared with 104 in 1938.

Research Work. Investigations were carried out on the following subjects :—

(1) Etiology and treatment of Kala-Azar in co-operation with the Medical Entomologist.
(2) Vaccine Lymph.
(3) Enteric Fever.
(4) Diphtheria.
(5) Lobar Pneumonia.

The Medical Entomologist and the Wellcome Chemical Laboratories were transferred to the Stack Laboratories during the year. The Medical Entomologist continues to carry out malarial investigations in the irrigated area of the Gezira, the Jebel Aulia and Sennar Dam Reservoirs, and Khartoum. Investigations were also carried out on the Sandfly distribution and habits with reference to Kala-Azar. The Wellcome Chemical Laboratories carried out analyses for Departments of Government, Provinces and private firms. 2,140 analyses were carried out during the year.

EPIDEMIC DISEASES.

CEREBROSPINAL MENINGITIS.

2,714 cases were reported with 647 deaths in the following provinces :—

Province.	Cases.	Deaths.
Darfur	2	2
Equatoria	2,602	606
Gezira	20	7
Kassala	5	2
Khartoum	55	13
Kordofan	22	15
Northern	8	2
Upper Nile	—	—

The incidence of this disease during the last ten years has been as follows :—

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1930	865	665	1935	3,249	2,154
1931	348	240	1936	13,440	8,906
1932	532	384	1937	446	293
1933	166	131	1938	234	124
1934	4,231	3,341	1939	2,714	647

An extensive epidemic broke out in the Tonj, Aweil and Lake Districts of Western Equatoria Province in January, continued throughout the rains and is still raging. The mortality at the start of the epidemic was 80% but treatment with intrathecal and intramuscular injections of drugs of the Sulphonamide group reduced the mortality of treated cases to approximately 10%.

Dr. J. Bryant reports on the outbreak in Tonj and Aweil as follows :—

Results of treatment have been fully described elsewhere. It is believed that in the hands of a Medical Inspector the mortality rate where chiefs and people cooperate should be in the region of 3% only. In the hands of dressers under similar circumstances 5%. The rate is so low that the occasional tuberculous or pneumococcal meningitis which is treated by a dresser as C.S.M. will raise the mortality rate very considerably if they are included in the returns.

At Kwajok where no attempt at co-operation has been made by the chief the mortality soars up to 60-80% of cases. At Gogrial and Panemweth 2-5% mortality only. Gogrial is 20 miles from Kwajok.

No attempt at rigid quarantine measures have been taken for the following reason.

1. Segregation of carriers has been shown to be impossible in England—more so here.

2. Natives naturally dislike long detention and cases are concealed and are only brought very late. Some lie as to the recent onset of the disease is told by relatives.

3. Police and military have to be used if quarantine is to be made even slightly effective.

4. Tribal and family life is upset.

5. So uncertain are we of the facts as to the spread of this disease that it had been thought inadvisable to disturb a home community without definite knowledge. Relapsing fever and small-pox on the other hand are different. These we can control to a large measure by quarantine, real quarantine with minute attention to detail.

The methods used here are briefly enumerated below :

1. Training all dressers in the technique of lumbar puncture.

2. Treatment units scattered at suitable distances from several small outbreaks.

3. Instant action in getting a team of dressers on to the site of an outbreak. It is believed that the disease here is spread largely by the sick themselves lying in a darkened hut surrounded by tightly-packed commiserating relations.

4. Upsetting the general community as little as possible and having a free and easy atmosphere in treatment centres without crowd formation.

To summarise, cure has been aimed at rather than quarantine.

Time and time again quick action by C. S. M. staff in getting on to an outbreak has been followed by cessation of the disease.

However, this epidemic has not been true to form. Scattered foci 50 or 100 miles apart have kept staff on the run all the season and made things very difficult and exhausting. An outbreak of 90 cases in the Tuic country was followed by a sudden and unexpected stoppage of the disease although the rains failed.

Low mortality figures depend largely on the time taken before a case reaches a centre. At Gogrial only 2 deaths occurred in 49 cases between July and November. In the record book both were entered as having been ill two days. Subsequent enquiring showed that one had been ill 15 and the other 10 days. The matter was reported.

Dr. R. B. U. Somers reports on the outbreak in the Lakes District as follows :—

The public health of the district was greatly affected by the cerebrospinal meningitis epidemic this year. The outbreak first started in the Agar country immediately east of Rumbek. In the first three days, before medical assistance was available, there were 44 cases with 33 deaths. Within a month of its start there were 326 cases with 100 deaths and then the disease appeared simultaneously in the north and the north-west of Rumbek. On the first of March the disease was reported in the Gok country 20 miles west of Rumbek. In spite of the district quarantine measures, the disease spread centrifugally in these areas and by the close of March it had crossed the river Niaam to the Yak country of the Agar. Towards the end of October the disease appeared amongst a gang of road workers in Yirrol and hence in the Cic country at Lau.

The measures taken to control the epidemic were :—

1. All the people were warned of the disease, the signs and symptoms of which were fully explained to them. Delay and concealment of cases were punishable acts.

2. Immediate construction of quarantines in infected areas.

3. All people were made to sleep out of doors in open ended rakubas.

4. Prohibition of dances and other assemblies.

5. Restriction of moves to and from infected areas in general and from the district in particular.

6. Closure of schools.

7. Encouraging the people to re-thatch their houses in the dry season.

The total number of infected cases was 1,743 with 389 deaths. The number of the treated cases was 1396 with 194 deaths giving case mortality of 13.89%.

Our thanks are due to the District Commissioners of the Lakes District, to the Officer Commanding Equatorial Corps, to the native Chiefs and to the dressers for their co-operation and help without which the spread of the epidemic would have been much more rapid.

Sporadic cases were reported from Khartoum, Kordofan and Northern Provinces.

DIPHTHERIA.

77 cases were reported with 14 deaths compared with 51 cases and 13 deaths in 1938.

The distribution was as follows :—

PROVINCE.	Cases.	Deaths.	PROVINCE.	Cases.	Deaths.
Darfur	—	—	Khartoum	25	2
Equatoria	—	—	Kordofan	8	3
Gezira	9	3	Northern	17	2
Kassala	17	4	Upper Nile	1	—

The incidence for the last ten years has been :—

YEAR.	Cases.	YEAR.	Cases.
1930	68	1935	60
1931	183	1936	63
1932	138	1937	36
1933	51	1938	51
1934	34	1939	77

This disease occurs sporadically in towns and districts liable to infection from the outside world.

RELAPSING FEVER.

1,006 cases were reported with 92 deaths compared with 1,124 cases and 116 deaths in 1938.

Cases were distributed among Provinces as follows :—

PROVINCE.	Cases.	Deaths.	PROVINCE.	Cases.	Deaths
Darfur	278	46	Khartoum	116	3
Equatoria	—	—	Kordofan	72	8
Gezira	402	29	Northern	21	—
Kassala	117	6	Upper Nile	—	—

Although every effort was made to prevent spread of infection by delousing immigrants and the whole population of villages where outbreaks were reported, the disease was reported sporadically from all provinces except Upper Nile and Equatoria Provinces, and village outbreaks occurred in Gezira and Khartoum Provinces. Although it was possible to prevent this disease from becoming epidemic, constant vigilance was necessary to ensure that cases were reported and dealt with at once. Rigorous preventive and curative measures were necessary to prevent a heavy mortality. Delousing stations were established on traffic routes across the Central Sudan and approximately 100,000 persons were deloused during the year.

SMALLPOX.

553 cases were reported with 103 deaths in the following provinces :—

Province.	Cases.	Deaths.	Province.	Cases.	Deaths.
Darfur	502	98	Khartoum	5	1
Equatoria	1	—	Kordofan	5	1
Gezira	40	3	Northern	—	—
Kassala	—	—	Upper Nile	—	—

580,052 vaccinations were carried out compared with 1,348,694 in 1938 and 561,197 in 1937, in the following provinces :—

Darfur	349,090	Khartoum	24,063
Equatoria	31,781	Kordofan	55,628
Gezira	29,534	Northern	29,599
Kassala	48,008	Upper Nile	12,349

At the beginning of the year cases were reported in Western Darfur Province from French Equatorial Africa and there seemed every likelihood of an extensive epidemic in this susceptible province unless the whole population was vaccinated at once.

Accordingly an attempt was made to carry out general vaccination and 349,090 vaccinations were carried out during the year. The disease remained sporadic except in Dar Masalit where several small village outbreaks occurred. In this remote frontier district difficulties were encountered with the shy suspicious tribesmen many of whom either fled into French Equatorial Africa on the arrival of the vaccinators or treated their arms to neutralise the effect of the calf lymph. The efforts of the authorities concerned however ensured that sufficient successful vaccinations were carried out to keep the disease in check.

7 cases were reported from Suki in Southern Gezira Province in June and the source of infection was traced to Gubra in Italian East Africa. As this area is well vaccinated the disease died out at once. A few sporadic cases were reported from Kordofan and Khartoum Provinces. Calf lymph made in the Stack Laboratories in Khartoum has been used for all vaccinations during the last three years and it has been found to be far more potent and satisfactory than imported lymph which loses its potency in transit. As a result it was possible to attempt to vaccinate the whole population of the Northern and Central Sudan and approximately 2,433,597 vaccinations have been carried out in the last three years among a population of about 4,000,000.

As an appreciable percentage had previously been vaccinated it is evident that the population of the northern two-thirds of the Sudan must be largely immunised. Every effort will be made to complete this campaign, and to carry out vaccinations as far as possible among the wilder tribesmen of the Southern Sudan in the near future. The Sudan with its large floating population of pilgrims from West Africa to and from Mecca has always been subject to periodic epidemics of smallpox and it is hoped that these public health calamities, so impressed in the minds of the Sudanese that they still refer to " Smallpox in Omdurman " in their proverbs, may be a thing of the past.

MEASLES.

An epidemic of unprecedented severity occurred in Equatoria Province in which there was a heavy mortality in children from the sequelae, particularly gastroenteritis and broncho pneumonia.

ENDEMIC DISEASES.

ANCYLOSTOMIASIS.

Although this disease is of no public health importance in the Northern Sudan where its distribution is restricted to a few small areas, it is a serious public health problem in the western part of Equatoria Province. Certain tribes appear to have far greater immunity from its effects than others but it is the main cause of hospitalisation in Rumbek area, and prevalent in Wau, Kajo Kaji and Juba districts. It is exceedingly difficult to devise effective preventive measures as even if it were possible to provide pit latrines on the vast scale necessary to deal with this big but scattered and wild population, it would be difficult to persuade the people to use them. Another difficulty is that the whole countryside is waterlogged for six months of the year and latrines would probably have to be replaced yearly. Possibly the only permanent solution is the gradual raising of the standard of living and education.

BILHARZIASIS.

The position as regards this disease remains unchanged in the Northern Sudan where it has ceased to be a public health problem in recent years. In the Southern Sudan there appears to be an exacerbation of the disease in Juba district possibly due to some temporary cause such as temporary lowering of the resistance of the population owing to shortage of food last season. The question is under investigation.

The following table shows the incidence of the disease among the indigenous population of the irrigated area of the Gezira since 1926 :—

YEAR.	ADULTS.			CHILDREN.			TOTAL.		
	No. Exmd.	No. Inftd.	%	No. Exmd.	No. Inftd.	%	No. Exmd.	No. Inftd.	%
1926	16,419	76	0.47	—	—	—	16,419	76	0.47
1929 ...	—	—	—	2,341	37	1.60	2,341	37	1.60
1930	—	—	—	3,322	20	0.57	3,322	20	0.57
1931	11,102	84	0.75	6,895	51	0.74	17,997	135	0.75
1932	9,618	51	0.53	1,707	19	1.10	11,325	70	0.62
1933	14,188	28	0.20	3,288	27	0.82	17,476	55	0.31
1934	12,769	5	0.04	3,583	2	0.07	16,352	7	0.04
1935	13,902	8	0.06	2,945	12	0.40	16,847	20	0.12
1936	22,604	10	0.04	5,483	17	0.31	28,087	27	0.09
1937	30,768	26	0.08	10,038	63	0.62	40,806	89	0.22
1938	32,045	50	0.15	16,916	162	0.95	48,961	212	0.43
1939	17,044	30	0.17	10,877	174	1.50	27,921	204	0.73

Dr. F. H. Goss, Senior Medical Inspector Gezira Province reports as follows :—

It is very satisfactory to report that the increase in Bilharzia is slight and that, for practical purposes, the situation is stationary. As explained last year the annual survey is now done amongst Gezira residents only.

We know that a large proportion of immigrant labourers are infected with bilharzia and it is from them that the danger of the spread of the disease is feared. It is again pointed out that the figures presented do not show the prevalence of the disease. The point at issue is as to whether there is an increase. This year's survey was done by three independent units and again the similarity of the results compared to those obtained since 1926 is very striking.

It would appear inevitable that over a period of years there will be an increase in the prevalence of the disease owing to the presence of large numbers of infected people who arrive from outside the area during the cotton picking season.

It is impossible to keep everyone from entering canals. A large scheme to provide piped water supplies to villages had to be abandoned during the year owing to the difficulty of obtaining materials. This was regrettable as the provision of a good water supply is the chief weapon in prevention. The eradication of bilharzia is a problem that would be better tackled by engineers than by doctors.

Senior Medical Inspector, White Nile Area reports that there is no indication of any increase of urinary or rectal bilharzia.

The routine preventive measures described in previous reports were followed.

NORTHERN PROVINCE.

Dongola and Merowe Districts.

The comparative figures for the last twelve years from the yearly survey are as follows :—

Year.	Number examined	Infections found.	Percentage	Year.	Number examined	Infections found.	Percentage
1928	12,213	2,259	18.0	1934	46,054	1,768	3.8
1929	17,925	2,187	12.2	1935	40,950	1,408	3.4
1930	26,094	2,443	9.3	1936	37,334	1,268	3.4
1931	37,405	1,765	4.6	1937	46,741	1,155	2.5
1932	49,077	2,470	5.0	1938	44,517	891	2.0
1933	58,711	1,825	3.1	1939	40,194	1,054	2.6

Wadi Halfa District.

The Senior Medical Inspector reports that Bilharziasis is of almost negligible importance to public health in this district.

The results of the campaign in this district, organised six years ago, are as shown by the figures of the yearly survey given below :—

Year.	Number examined.	Infections found.	Percentage	Year.	Number examined,	Infections found.	Percentage
1934	20,180	3,927	19.4	1937	18,498	2,002	10.8
1935	12,076	2,613	21.6	1938	21,958	2,763	12.5
1936	12,437	1,439	12.9	1939	18,319	2,422	13.1

Berber and Shendi Districts.

Dr. L. H. Henderson Senior Medical Inspector Northern Province reports as follows :—

The disease is undoubtedly on the decrease throughout the area.

The writer carried out a bilharzial survey of the area from Berber to Abu Hamad in 1926. At that time the disease was pandemic in children, occurring in 60 to 80% of all examined. Now the disease is mostly epidemic in the more heavily infected areas only, otherwise sporadic. The highest incidence occurs in March to May when the Nile is low and suitable pools for snail propagation are plentiful.

Infected children rarely appear ill from the disease and, when they do, the cause is probably hyperinfection or a coincident infection with some debilitating disease.

The disease appears to be self-limiting, showing a considerable tendency to die out in the individual after the age of puberty.

Certain definite areas of rectal schistosomiasis exist in this part of the province particularly at Timeirab and Zeidab. A survey recently carried out showed an incidence of 6% only in these areas though a survey of the district in 1933 found the incidence as high as 27%.

The reduction in the incidence of the disease is attributable chiefly to :—

1. Increased dispensary system allowing for more universal treatment of the disease.

2. Destruction of snails by syzolin in all available districts.

3. Provision of wells to encourage natives to live on high ground away from the river.

BLACKWATER FEVER.

20 cases were reported with 7 deaths.

The figures for the last six years are as follows :—

YEAR.	Cases.	Deaths.	Year.	Cases.	Deaths.
1934	34	9	1937	20	5
1935	18	9	1938	29	8
1936	38	14	1939	20	7

The nationalities affected were :—

	Cases.	Deaths.
Sudanese Arab	11	2
Sudanese Negroid	—	—
Greek	2	—
Italian	2	2
Egyptian	3	1
British	2	2
	20	7

The following table shows the incidence by age and sex in the various areas :—

PROVINCE	DISTRICT	MALE		FEMALE		AGE GROUPS.							
		A	D	A	D	0–1	1–5	5–15	15–25	25–35	35–45	45–65	65 and over
Darfur	Kuttum	1	1	—	—	—	—	—	—	1	—	—	—
Equatoria	Wau	1	—	2	2	—	—	—	1	1	1	—	—
	Torit	1	—	—	—	—	—	1	—	—	—	—	—
Gezira	Gezira	4	2	1	—	—	1	1	1	1	1	—	—
	Fung	—	—	—	—	—	—	—	—	—	—	—	—
	White Nile	—	—	—	—	—	—	—	—	—	—	—	—
Kassala	Kassala	1	—	—	—	—	—	—	—	—	1	—	—
Khartoum	Omdurman	2	—	—	—	—	—	—	1	1	—	—	—
Kordofan	Central	1	—	—	—	—	—	—	1	—	—	—	—
	Western	1	—	—	—	—	—	—	1	—	—	—	—
	Nuba Mts.	1	—	1	1	—	—	—	—	—	2	—	—
Northern	Berber	—	—	1	—	—	—	—	—	1	—	—	—
	Halfa	1	1	—	—	—	—	—	1	—	—	—	—
Upper Nile	Malakal	1	—	—	—	—	—	—	—	—	1	—	—
TOTAL		15	4	5	3	—	1	2	6	5	6	—	—
DEATHS		....	....	....		—	—	—	1	3	3	—	—

DRACONTIASIS.

Although considerable progress has been made in protecting village water supplies against infection particularly in the Southern Sudan, it remains prevalent in the Nuba Mountains, Equatoria Province and the Bor district of Upper Nile Province.

It is expected that the incidence will fall in all districts except the Nuba Mountains as the water supplies improve, but in the latter area the problem is almost insoluble in the mountain ranges as infection occurs from numerous rock pools which cannot be dealt with effectively. The population are wild, primitive, and extremely inaccessible. All that can be done is to ensure that the town water supplies are safeguarded in the district, and to attempt to reduce the incidence gradually by propaganda and early treatment of cases by the numerous chiefs dressers who wander about the hills.

PROVINCE.	Cases. Treated.	PROVINCE.	Cases. Treated.
Darfur	287	Khartoum	—
Equatoria	2,368	Kordofan	470
Gezira	296	Northern	—
Kassala	6	Upper Nile	168
TOTAL			3,595

DYSENTERY.

3,528 cases were admitted to hospital of which 3,347 were diagnosed as amoebic and 181 as bacillary dysentery.

The following table shows the admission to hospitals given as the percentage of the total admissions from all causes for 1939 and the previous nine years :—

	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Amoebic Dysentery	2.68	3.28	2.51	3.25	3.00	2.83	2.49	2.48	2.76	3.18
Bacillary Dysentery	0.37	0.41	0.41	0.38	0.28	0.26	0.18	0.13	0.13	0.17
	3.05	3.69	2.92	3.63	3.28	3.09	2.67	2.61	2.89	3.35

ENTERIC FEVER.

202 cases of typhoid and paratyphoid fevers were reported with 20 deaths.

The following table shows the incidence of this disease during the last ten years :—

1930	73	1935	246
1931	100	1936	135
1932	85	1937	165
1933	204	1938	213
1934	188	1939	202

Its distribution is still restricted to those towns and areas which have close contact with Egypt and other neighbouring countries. An outbreak occurred in Shendi, Northern Province in June in which 25 cases with 5 deaths were reported.

Of the cases reported in 1939, 199 were typhoid, 2 were paratyphoid A, and 1 paratyphoid B.

HYDATID DISEASE.

13 cases were reported from the endemic centre of Kapoeta in Eastern Equatoria Province compared with 19 in 1938 and 26 in 1937.

LEISHMANIASIS.

394 cases were reported with 104 deaths.

The incidence during the last ten years has been as follows :—

Year.	Cases.	Year.	Cases.
1930	56	1935	171
1931	84	1936	214
1932	103	1937	336
1933	202	1938	295
1934	289	1939	394

KALA-AZAR.

387 cases were reported with 104 deaths.

The distribution of the disease in the Sudan remains the same and the long endemic area along the whole length of the Italian East African frontier provides nearly all the cases.

Investigations are being carried out regarding the etiology of this disease. No appreciable difference in incidence is recognisable from year to year and it appears to remain mildly endemic under normal public health conditions. The disease is of public health importance owing to the possibility that any lowering of the general standard of resistance by malarial or food scarcity might result in its becoming epidemic and invading the Gezira and other important thickly populated areas to the north. Much work is being carried out in Singa testing various new drugs in an attempt to discover more satisfactory methods of treatment than are available at present.

Gezira Province.

Dr. F. H. Goss, Senior Medical Inspector, Gezira Province reports as follows :—

The main foci of leishmaniasis in the province are in the Fung Area. Senior Medical Inspector, Fung Area is of the opinion that there is no evidence that the disease is increasing or that it is spreading further afield. The increase in the number of cases is due to more refined methods of diagnosis and the spread of the knowledge of the disease amongst the inhabitants.

He notes that in the Sennar district, most cases come from the vicinity of Suki, the Dinder, Hawata, Hasira and Atshana.

It is observed from Singa that kala-azar cases are extremely susceptible to intercurrent infection. The converse is commented on by the Senior Medical Inspector who finds that patients suffering from other medical conditions often merge into active kala-azar.

Sternal puncture is being used in Medani and the Fung hospitals as an aid to diagnosis and for the study of the blood picture.

Leishman Donovan bodies were found in the peripheral blood in a case in Roseires hospital. The Government Bacteriologist obtained a fox at Singa with a leishmanial sore on its nose and Medical Officer, Singa reports a monkey found infected in its natural state. One dermal lesion was noted at Medani and three in the Fung Area.

Various antimony products have been used in treatment in Fung hospitals during the last three years, but none of them can be accepted as the drug of choice as the gross fatality rate of approximately 20% remains unaltered.

Blood sedimentation reactions are being done at Sennar and the results appear to be promising as an aid to prognosis.

Equatoria.

Kapoeta district. 72 cases of kala-azar were admitted to hospital compared with 83 in 1938. As usual most of the cases came from the Tapotha tribe.

Kassala Province.

There has been an increase in the number of patients admitted to Gedaref hospital suffering from kala-azar where 47 cases were admitted compared with 19 in 1938 and 40 in 1937.

Upper Nile Province.

Dr. H. M. Elliott, Senior Medical Inspector reports as follows :—

46 cases with 20 deaths are reported. The large majority of these cases are from the Paloic Dinka, only five coming from other areas.

Sporadic cases occur over a wide area north of the Sobat-Lake No line, but for over 2 years there has been an epidemic form in the Paloic Area. The number of cases that have occurred in this area is much larger than the number that have presented themselves for treatment and the mortality has been high. There is some evidence that the epidemic is abating in this area, but from reports received it is feared that it is moving south. This is being investigated.

Among those presenting themselves for treatment mortality was very high in the late cases, but results were much better in the early ones.

Extreme care has had to be exercised in the use of neostibosan in seriously ill cases and it has been found that urea stibamine, which is effective in controlling the worst symptoms, is tolerated much better and in higher dosage. Therefore this drug has been used with success, at the beginning of treatment in late cases, a change to neostibosan being made when the general condition of the patient has sufficiently improved.

Ascolis treatment has been tried in a few cases after completion of a course of antimony but with little effect on the size of the spleen or on the general condition of the patient, although extremely good results have attended the use of this treatment in cases of chronic malaria.

Cancrum oris was a terminal event in several cases and only two cases have recovered after developing this.

A follow-up has been done of the cases that have been discharged from hospital as cured during the past eighteen months.

Of 23 cases that could be traced 18 have had no relapse and 12 of these were seen by the Medical Inspector at an interval of 7-12 months after completion of treatment and all appeared healthy. Four cases had died since being discharged from hospital. One case had 2 relapses, for which he received further treatment, and he has been symptom free for over a year.

Work is now being done on the distribution of sandflies in the kala-azar area.

ESPUNDIA.

2 cases were reported during the year from Darfur Province.

CUTANEOUS LEISHMANIASIS.

5 cases were reported of which 2 were from Darfur and 3 from Gezira Province.

DISTRIBUTION.

Province.	District.	Male		Female		Age Groups							
		A	D	A	D	0–1	1–5	5–15	15–25	25–35	35–45	45–65	65 and over
Darfur	Darfur	14	6	—	—	—	—	8	3	1	—	2	—
Equatoria	Kapoeta	52	4	20	1	—	6	37	23	3	3	—	—
Gezira	Gezira	27	12	2	1	—	1	5	12	6	3	1	1
	Fung	134	31	30	9	2	8	46	51	48	7	2	—
Kassala	Kassala	7	2	—	—	—	—	—	4	3	—	—	—
	Gedaref	37	10	13	3	—	4	9	16	13	7	1	—
	Port Sudan	—	—	1	1	—	—	—	—	1	—	—	—
Khartoum	Khartoum	7	3	2	—	—	—	—	3	3	3	—	—
Kordofan	Nuba Mts.	1	1	—	—	—	1	—	—	—	—	—	—
Northern	Atbara	1	—	—	—	—	—	—	1	—	—	—	—
Upper Nile	Malakal	29	12	17	8	—	1	15	18	11	1	—	—
Total	....	309	81	85	23	2	21	120	131	89	24	6	1
Deaths	....	....	....		....	1	7	31	30	25	8	1	1

RACE.

The races affected were :—

Sudanese (Arab)	198	Abyssinians	14
Sudanese (Negroid)	157	Greek	1
West Africans	23	Uganda Natives	1

RESULTS OF TREATMENT.

	Apparently cured %	Died. %	Still under treatment %	Untreated or lost sight of %.
1937	37	17	28	18
1938	35.6	18.3	18.7	27.4
1939	42.1	26.4	21.1	10.4

LEPROSY.

The following table shows the distribution of lepers in the Sudan :—

Province	Under treatment in camps or settlements.	Under observation and treatment as hospital or dispensary outpatients.	Total under treatment.	Under observation but not under treatment.	Total cases.
Darfur	—	7	7	—	7
Equatoria	1,860	63	1,923	2,448	4,371
Gezira	44	27	71	92	163
Kassala	32	—	32	1	33
Khartoum	—	20	20	9	29
Kordofan	89	45	134	1,875	2,009
Northern	—	4	4	53	57
Upper Nile	35	16	51	—	51
TOTAL	2,060	182	2,242	4,478	6,720

The estimated number of lepers in the Sudan is 8,000.

NORTHERN SUDAN.

Leprosy remains a rare disease in this area and the few cases which occur are isolated and treated in their houses where possible. A small settlement at Gedaref caters for those for whom it is undesirable or impracticable to arrange domiciliary treatment.

CENTRAL SUDAN.

The incidence of leprosy is heavier particularly among the settled population as opposed to the nomads who remain remarkably free from this disease In this area housing conditions are more primitive than in the Northern Sudan and it would be impossible in many parts to arrange domiciliary treatment satisfactorily. In any case the incidence of the disease in certain districts is high enough to justify the introduction of the settlement system. Accordingly small leper settlements have been organised near and under the supervision of dispensaries and hospitals. The settlements are self-supporting as regards vegetables, fruit and milk.

SOUTHERN SUDAN.

The incidence is high in many parts of Southern Equatoria Province along the southern borders of the Sudan. Large settlements were founded some ten years ago to which all the known cases of leprosy were admitted. Many cases have since been discharged and the settlements have considerably decreased in size. They now serve as centres to which infectious cases and those needing special treatment are admitted, and which keep a close watch on and record of the numerous discharged lepers who remain under surveillance in their own homes receiving treatment when indicated from the nearest dispensary. New segregation camps for infectious cases have been completed at Li Rangu and Yubo settlements.

More recently an attempt has been made to supplement this organisation by using the services of the local native administrative authorities who are forming and accepting responsibility for small settlements in their districts under medical supervision.

GENERAL.

It is exceedingly difficult to assess the incidence of leprosy in the Sudan but there is no evidence of any increase in incidence over a series of years, and it is probably less important as a public health problem in the Sudan than in most tropical African territories.

MALARIA.

9,128 cases were admitted to hospital with 78 deaths compared with 11,573 cases and 84 deaths in 1938. The reduced incidence is due to favourable climatic conditions in the Northern Sudan during the second half of the year.

GEZIRA PROVINCE.

The incidence in the Gezira and Wad Medani showed a decrease owing to the light well spaced rainfall.

GEZIRA AREA.	1938		1939	
	Cases	Deaths	Cases.	Deaths
Hospital inpatients	2,042	7	1,017	10
Hospital outpatients	11,056	—	1,369	—
Dispensary outpatients	43,560	—	25,496	—

The Malignant Tertian is the prevailing infection and the figures of the various types found on microscopic examination were as follows :—

Malignant Tertian	Benign Tertian	Quartan.
1,362	510	227

NORTHERN PROVINCE.

The incidence has been low throughout the Province as a whole. The abnormally low Nile flood failed to fill the basins and the mosquito density was considerably reduced as a result.

GENERAL.

Malaria remains the principal public health problem in the Sudan, and it is only by constant effort that it is possible to keep the urban districts relatively clear of the disease. Every year with increase in staff and improved methods, the measures taken against this disease become more effective, but on the other hand improved communications and the extension of certain amenities such as gardens, work in its favour.

The organisation against malaria has developed sufficiently to prevent the extensive epidemics which used to devastate parts of the Sudan with heavy loss of life, and to keep the disease well under control in the urban and more populated rural areas in the Northern Sudan such as the Gezira and the Northern Riverain Province. The following table shows the spleen rate of children examined in the intermediate and village schools during the last three years. In the Northern Sudan these figures provide a fairly accurate index of the endemicity of malaria but in the Southern Provinces of Equatoria and Upper Nile where schools are few and where the children examined are to some extent living under protective conditions the spleen rate does not indicate the incidence of malaria which is high throughout the year :—

% Spleen Rate			PROVINCE AND DISTRICT.	TYPE OF PARASITE, 1939		
1937	1938	1939		% Benign	% Malignant	% Quartan
46.9	50.1	45.2	DARFUR PROVINCE	30.3	68.1	1.6
			EQUATORIA PROVINCE.			
20.7	22.6	29.2	Central District	9.2	89.6	1.2
17.7	—	38.4	Western District	22.5	75.1	2.4
—	—	16.5	Zande District	66.0	34.0	—
			GEZIRA PROVINCE.			
16.6	25.9	26.7	Blue Nile	24.2	64.9	10.9
29.0	44.7	32.5	White Nile	51.4	48.2	—
46.9	50.3	46.4	Fung	32.7	66.3	1.0
			KASSALA PROVINCE.			
10.1	8.5	9.6	Port Sudan	38.7	43.5	17.8
27.8	22.7	19.5	Kassala	83.7	15.5	0.8
2.7	2.5	6.6	KHARTOUM PROVINCE	22.3	76.8	0.9
32.2	44.1	37.9	KORDOFAN PROVINCE	28.9	69.4	1.7
			NORTHERN PROVINCE.			
7.8	3.9	1.9	Wadi Halfa	73.1	26.2	0.7
16.8	15.6	18.9	Dongola	70.9	29.0	0.1
13.2	13.2	9.0	Berber	24.96	75.0	0.04
17.9	32.1	32.3	UPPER NILE PROVINCE	2.6	96.4	1.0

RABIES.

The disease continues to have a nuisance value far greater than the number of cases would suggest.

YEAR.	Number of persons receiving treatment.	Deaths despite treatment.	Total. deaths.
1932	226	4	8
1933	75	6	12
1934	198	6	8
1935	290	4	10
1936	373	1	8
1937	534	6	11
1938	557	1	8
1939	422	8	16

All those treated, had been actually bitten.

The biting animals were as follows :—

Dogs	Donkeys	Cats	Lion	Camels	Monkey
403	10	4	1	3	1

The following data is available as regards the fatal cases :—

Locality.	Age.	Sex.	Biting Animal.	Site of Bite.	Severity of Bite.	No. of days after bite when treatment was begun.	No. of Injections given.	No. of days from bite to fatal termination.
(a) THOSE TREATED.								
Darfur	14	Male	Dog	R. Thumb	Severe	Same day	14	
,,	8	,,	,,	L. Arm	,,	,, ,,	10	
Gezira	9	Female	,,	L. Leg	Superificial	4 days	14	3 months
,,	10	Male	,,	Lip	Very Severe	Same day	14	1 month
,,	—	,,	,,	—	—	—	14	25 days
Kordofan	12	,,	,,	R. Arm	Superificial	6 days	8	41 days
,,	70	,,	,,	R. Eye	Very Severe	10 days	14	37 days
Northern	50	Female	,,	Wrist	Superificial	45 days	1	47 days
(b) THOSE NOT TREATED.								
Darfur	40	Male	Dog	Face	Superificial	—	—	—
,,	60	,,	,,	L. Hand	Severe	—	—	—
Gezira	22	,,	,,	Hand	Medium	—	—	47 days
,,	35	,,	,,	Leg	Superificial	—	—	65 days
,,	42	,,	,,	Leg	,,	—	—	45 days
,,	55	,,	,,	L. Hand	,,	—	—	3 months
Khartoum	41	,,	,,	,,	Severe	—	—	—
Upper Nile	13	,,	,,	Ankle	Medium	—	—	30 days.

ACUTE RHEUMATISM.

303 cases with 4 deaths were reported compared with 292 cases with 4 deaths in 1938 and 274 with 2 deaths in 1937.

The distribution of cases was as follows :—

PROVINCE.	Cases.	Deaths.	PROVINCE.	Cases.	Deaths.
Darfur	103	—	Khartoum	29	1
Equatoria	12	1	Kordofan	37	—
Gezira	18	1	Northern	49	1
Kassala	50	—	Upper Nile	5	—

SCURVY.

189 cases with 7 deaths were reported compared with 84 cases with 5 deaths in 1938.

SLEEPING SICKNESS.

109 cases were reported in Equatoria Province compared with 110 in 1938. Of these 103 occurred in the Eastern Zande district and 6 in Kajo-Kaji.

The incidence during the last ten years has been as follows :—

YEAR.	Yubu	Yambio.	Yei.	Kajo-Kaji.
1930	37	1	—	—
1931	61	1	—	—
1932	49	14	—	—
1933	70	12	1	—
1934	20	2	4	6
1935	80	—	1	10
1936	142	—	—	8
1937	63	1	2	23
1938	106	—	—	4
1939	103	—	—	6

347,411 palpations were carried out during the year and 2,419 gland punctures were performed.

Large scale experiments have been carried out during the last two years with the method of systematic catching of tsetse fly between large block clearings and it is hoped that it will be possible to assess the value of this measure in the near future. As regards its effect on the incidence of the disease, it seems to have had a marked effect in diminishing the density of fly in certain blocks.

The decentralisation of treatment to dispensaries, and the abolition of the compulsory period in hospital which at one time was as long as three years, has been much appreciated by the people. Modern methods of treatment are so effective in the present Sudan type of the disease that the mortality is negligible, and the disease is of importance more from the large staff which are required to keep it under control than from its effect on the indivudual.

Yei District. 6 cases were detected in 1939 compared with 4 in 1938. 4 of these 6 cases were found in the old endemic areas and the other 2 were discovered in non endemic places, but these were proved to have been wandering in the old endemic areas. All cases were found at Kajo-Kaji. Yei area has remained free for the last 2 years.

Zande District. 103 cases were detected at Yubu compared with 105 in 1938. As in previous years the incidence is heavier in women who are more liable to visit fly infested streams as water carriers. There were three deaths two of whom were caused by secondary causes, *i.e.*, Pneumonia and old age. Dr. Hunt, Senior Medical Inspector, Yubu reports as follows on the progress of the block method of fly elimination :—

Fly-catching throughout Block I was in full operation by January, 1938, but the path cutting and clearings in Blocks II and III were not completed until December of the same year. Fly-catching in the latter two Blocks has therefore only been in effective operation since January, 1939. To cope with this extension of the work a greatly increased staff of fly boys was required, recruiting was therefore brisk at the beginning of the year and the necessary staff was soon obtained, it now consists of the following :—

Northern Sanitary Overseers	2
Group Leaders	4
Section Leaders	13
Fly Boys	84
Terabis	2

The group leaders are boys with an Intermediate School education, three of whom underwent a course of sanitary instruction at Juba but failed to qualify as Sanitary Overseers. Each is in charge of three or four sections.

The Section Leaders are promoted from among these fly boys who are literate in the vernacular, and each is in charge of a section consisting of from 4 to 12 boys.

The Terabis have a "roving commission" and report delinquents to their groups leaders.

Each fly boy is provided with a net and a cane knife with which he keeps the paths clean as he patrols them, this saves any expenditure on the upkeep of fly paths once they have been opened up through the bush. All are subject to a semi-military type of discipline.

The above staff is the bare minimum at present required to cope with this considerable stretch of river consisting as it does of 160 miles of streams and about 250 miles of paths. The total area has been divided into 13 sections each of which is constantly patrolled by a gang of boys varying in number according to the lengths of paths involved and the density of the fly in that particular section.

Block clearing No. III, which is the most important of all the clearings acting as it does as a barrier between Block III and the uncontrolled lower reaches of the river north of Tembura, has given rise to some trouble as it is found to be allowing some fly to cross it from east to west. In spite of increasing its length from 800 to 900 yds. a few flies are still getting across, this may be due to the heavy bushes which grow with remarkable rapidity along the edges of the water course and this year owing to lack of funds it has been impossible to keep them down. In any case it has been decided to increase the length of this clearing early in 1940 as it has been proved in other parts of Africa that a single thousand yard clearing is not completely effective against *G. Palpalis.*

When Blocks II and III were first opened up the density of fly was found to be considerable, fly-catching operations have decreased this to a remarkable extent.

Details of fly-catching over the whole area are as follows :—

January and February	8,716
March and April	4,139
May and June	2,678
July and August	3,674
September and October	2,380
November and December	1,477

Total palpalis catches for the year.................................... 23,064
of these flies 12,097 were females, 1,921 of whom were gravid.

From the above figures it will be appreciated that the fly density throughout the whole area has shown a very satisfactory and encouraging decrease and it is now so low that when expressed as "flies-per-boy-hour" the figures consist of decimals, in order to save any confusion to which this might give rise, our densities are now expressed as "flies-per-boy-week." It is impossible within the confines of this report to give the density figures for each month in each section since work commenced, but there has been a remarkable reduction in Block I which is now maintained at such a permanently low figure that it is extremely doubtful whether it is possible for any further infection of man to take place. The fact that 6 sleeping sickness cases associated with this area were detected during the year does not belittle this assumption as the fly population during the first few months of the year had not at that time been reduced to its present negligible proportions, and the interval between infection of man by trypanosomes and his detection as a positive case of sleeping sickness is in some cases quite a long one.

It is unfortunate that the decrease in the incidence of sleeping sickness in any area will not show itself for some time after the fly density has been reduced to a minimum, and in order to amplify this statement it is pointed out that were all the fly in a given sleeping sickness area to be *suddenly* annihilated one would still continue to find so-called *new* cases for some considerable time afterwards.

With regard to Blocks II and III the fly-catches for December show an average density per section of only 2.6 flies per-boy-week and it is therefore assumed (with it is thought considerable justification) that here also we are rapidly approaching a density low enough to prevent any new infections occurring.

Sleeping sickness inspections carried out by the local Zande staff with the chiefs responsible for the discipline, were extended to new districts during the year. It is hoped in due course to have all the sleeping sickness inspections in the area supervised by the chiefs themselves. A doctor however must always visit the area during the inspection to track down the origin of infection of new cases and to keep a watchful eye on the dressers and chiefs clerks.

The new census which was completed in the form of a card index system early in the year has worked very satisfactorily. An experiment was carried out with Prophylactic Bayer in a small infected area, and the conclusions drawn were that this method should only be used in cases where it is known for certain that the infected belt is completely isolated from any other fly belt, and the population in contact with the infected belt must be sufficiently small to permit of the expenditure involved in the wholesale administration of such an expensive drug.

TUBERCULOSIS.

1,081 cases were admitted to hospital of whom 685 were pulmonary and 396 non-pulmonary.

Wadi Halfa and Dongola districts of the Northern Province continue to furnish many cases. The Southern Sudan shows an increased incidence of pulmonary tuberculosis. The situation as regards this disease in this area will require careful observation during the next few years.

Contacts are regularly examined in Khartoum and efforts are being made to introduce this system in other districts. It is really a question of how far the gradual raising of the standard of living will compensate for the increasing risk of infection from without.

53 of the pulmonary cases were foreigners and 23 were Sudanese who had contracted the disease in Egypt.

	Pulmonary	Non-pulmonary.
West Africans	24	20
Egyptians	3	—
Eritreans	7	6
Abyssinians	4	—
Greeks	1	—
Yemenis	8	—
Somalis	2	2
Indians	2	—
Hedjazis	2	—

The following table shows the admissions and percentage rate of tuberculosis to other admissions for the northern and southern Sudan for the last four years :—

	1936		1937		1938		1939	
	Pul.	Non. Pul.	Pul.	Non. Pul.	Pul.	Non. Pul.	Pul.	Non. Pul.
NORTHERN SUDAN Admissions for Tuberculosis	451	313	418	331	550	336	563	333
Total Admissions	65,392		66,881		67,622		66,961	
Percentage Tuberculosis to total admissions	0.69	0.47	0.62	0.49	0.81	0.49	0.84	0.49
	1.16		1.11		1.30		1.33	
SOUTHERN SUDAN Admissions for Tuberculosis	68	36	70	64	73	68	122	63
Total Admissions	30,689		34,207		36,744		38,142	
Percentage Tuberculosis to total admissions	0.22	0.11	0.20	0.19	0.20	0.18	0.32	0.16
	0.33		0.39		0.38		0.48	

The following table shows the admissions for pulmonary and non-pulmonary tuberculosis in the last ten years and the percentage rate of tuberculosis to other admissions :—

YEAR.	Pulmonary		Non-Pulmonary		Total	
	Admissions	Percentage	Admissions	Percentage	Admissions	Percentage
1930	480	0.95	300	0.61	780	1.56
1931	390	0.65	294	0.49	684	1.14
1932	421	0.70	281	0.47	702	1.17
1933	521	0.74	394	0.56	915	1.30
1934	557	0.65	437	0.50	994	1.15
1935	501	0.56	371	0.42	872	0.98
1936	519	0.54	349	0.36	868	0.90
1937	488	0.48	395	0.39	883	0.87
1938	623	0.59	404	0.39	1,027	0.98
1939	685	0.64	396	0.38	1,081	1.02

AGE INCIDENCE.

The following table shows the incidence of cases and deaths by age from pulmonary tuberculosis :—

AGE PERIODS.	0-1		1-5		5-15		15-25		25-35		35-45		45-65		65 and over		Total	
	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D
Northern Sudan	1	–	1	1	12	1	119	20	228	55	122	19	74	19	6	1	563	116
Southern Sudan	–	–	–	–	8	–	22	6	46	7	38	7	7	1	1	–	122	21

PULMONARY TUBERCULOSIS.

Comparative table showing the occupations of persons affected with pulmonary tuberculosis in the Northern Sudan during the last five years :—

Occupation	Cultivators.	Nomads.	Soldiers, Sailors and Police.	Day Labourers.	Townsmen			Indigent and un-employed.	Women Not employed	Children.	TOTAL.
					Artisans & Shop-Keepers.	Clerical.	Servants.				
1934	124	25	5	57	110	—	—	47	79	5	452
1935	113	15	9	43	94	—	—	51	87	3	415
1936	104	8	14	53	99	—	—	73	96	4	451
1937	117	5	19	73	47	26	12	72	107	10	488
1938	135	—	17	97	61	19	18	86	115	2	550
1939	164	—	13	72	46	11	28	111	108	10	563

NON-PULMONARY TUBERCULOSIS.

Admissions for non-pulmonary tuberculosis were classified as follows :—

	Gland.	Bone	Joint	Other	Total
Northern Sudan	151	104	36	42	333
Southern Sudan	26	24	7	6	63

Age groups were as follows :—

	0-1	1-5	5-15	15-25	25-35	35-45	45-65	65 & over
Northern Sudan	3	10	41	61	101	72	36	9
Southern Sudan	—	2	11	6	29	14	1	—

TUMOURS.

729 cases were admitted, classified as follows :—

Malignant	Carcinoma	126	
	Sarcoma	61	
	Unclassified	49	 236
Benign			 493

The following are the comparative figures for the northern and southern, Sudan, shown as a percentage of total admissions, for the last four years :—

	1936		1937		1938		1939	
	Malig-nant.	Non-Malig-nant.	Malig-nant.	Non-Malig-nant.	Malig-nant.	Non-Malig-nant.	Malig-nant.	Non-Malig-nant.
Northern Sudan. Admissions for new growths	167	315	161	407	166	321	219	411
Total Admissions	65,392		66,881		67,662		66,961	
% of Total Admissions	0.25	0.48	0.24	0.60	0.24	0.47	0.33	0.61
Southern Sudan. Admissions for new growths	25	251	16	164	30	124	17	82
Total Admissions	30,689		34,207		36,744		38,142	
% of Total Admissions	0.08	0.81	0.04	0.45	0.08	0.34	0.04	0.21

The incidence by age and sex of the malignant cases was as follows :—

	Sex		Age Incidence.								
TYPE.	Male	Female	0-1	1-5	5-15	15-25	25-35	35-45	45-65	Over 65	Un-known
Carcinoma	64	62	—	—	2	3	23	16	59	23	—
Sarcoma	33	28	—	1	6	8	11	13	15	5	2
Unclassified	30	19	—	1	6	4	7	8	18	5	—
TOTAL	127	109	—	2	14	15	41	37	92	33	2

UNDULANT FEVER.

29 cases with 1 death were reported compared with 28 cases and 3 deaths in 1938 and 33 cases and one death in 1937. It remains relatively common in the Eastern Sudan.

VENEREAL DISEASES.

SYPHILIS.

The incidence of this disease is probably slowly declining. Although syphilis is common in many districts particularly Kassala Province and the Western Sudan the Sudanese suffer from it in so slight a form that it causes little morbidity nor is there any evidence to show that it is an important factor in producing abortion. Facilities for treatment are available at all hospitals and dispensaries and every effort is made to ensure that treatment is completed. Novarsenobillon is not allowed to be used unless there is a reasonable probability that the patient will take a full course.

GONORRHOEA.

Treatment with the sulphonamide group of drugs has proved effective in shortening the stay in hospital, and is certainly more efficacious than any other line of treatment in outstations. Gonorrhoea is probably a more serious public health problem among the Sudanese than syphilis as a cause of sterility and strictures.

YAWS.

This disease is now restricted to remote southern districts where it is being dealt with.

PUBLIC HEALTH AND HYGIENE.

(By Mr. H. A. Crouch.)

INTRODUCTION.

The heavy rains in 1938 resulted in a good harvest and plentiful supplies of grain. The economic condition of the people remained satisfactory throughout the year. Progress continued to be made in improving general sanitation throughout the country, and an adequate subordinate public health staff is now available for the supervision of all areas. Smallpox threatened Darfur Province from the west but a rigorous vaccination campaign enabled the local public health authorities to keep the disease under control and it remained sporadic except for a few village outbreaks among the wild suspicious population of the western district.

Relapsing fever continued to be carried across the Sudan by West Africans wandering to and from the pilgrimage via Italian East Africa but any small outbreaks which occurred were reported at once owing to the network of dispensaries and effectively dealt with. Cerebrospinal meningitis was epidemic in the Dinka district of Equatoria Province but it has been found possible to reduce the mortality enormously by the use of the Sulphonamide group of drugs. An extensive epidemic of measles took a heavy toll of the children in many parts of Equatoria Province

The incidence of malaria was above average in the Northern and Central Sudan at the beginning of the year as an aftermath of the high incidence after the heavy rains and high river flood level of 1938. Owing to the exceptionally favourable climatic conditions during the year it fell to normal in March, and remained well below average. A corresponding reduction in the number of cases of malaria admitted to hospital resulted.

A purification plant and piped water supply was installed at Malakal, and a scheme is at present under consideration for providing a filtered supply for Kosti.

AEDES AEGYPTI SURVEY.

The survey of *Aedes aegypti* was continued by the Public Health Section of the Sudan Medical Service. Inspections of houses etc., were made and the numbers of inspections reported monthly by the Senior Medical Inspector or Public Health authority of each province or district. Specimens of mosquitoes were sent to the Medical Entomologist for the determinations to be checked.

The figures thus obtained are shown in the following table.

Sixty-nine per cent. of the specimens of *Aedes* received were *Aedes aegypti* and the remainder chiefly *Aedes vittatus* Bigot and *Aedes metallicus* Edwards.

Province.	District.	Number of inspections reported.	Number of findings of Aedes Aegypti.
Darfur	El Fasher	201,565	117
,, ...	Geneina	82,485	—
Equatoria	Juba	130,894	43
,, ...	Rumbek	984	—
,, ...	Source Yubo	11,656	—
,, ...	Torit	9,772	—
,, ...	Wau	90,440	—
,, ...	Yei	66,963	—

PROVINCE.	DISTRICT.	Number of inspections reported.	Number of findings of Aedes Aegypti.
GEZIRA	Dueim	4,654	—
,,	Kosti	32,649	—
,,	N. Gezira villages	51,640	—
,,	Roseires	33,840	3
,,	Sennar	133,068	—
,,	Wad Medani	918,666	1
KASSALA	Gedaref	33,607	—
,,	Kassala	158,693	2
,,	Port Sudan	267,987	8
,,	Suakin	24,364	26
,,	Tokar	11,497	10
KHARTOUM	Gordon's Tree	12,459	—
,,	Jebel Aulia	239,535	—
,,	Khartoum	1,132,854	1
,,	Khartoum North	568,111	—
,,	Omdurman	144,578	—
KORDOFAN	Bara	20,513	2
,,	Dilling	40,541	10
,,	El Obeid	321,855	2
,,	Kadugli	20,888	10
,,	Nahud	102,829	6
,,	Talodi	6,625	3
,,	Um Ruaba	44,700	2
NORTHERN	Atbara	890,195	—
,,	Dongola	250,664	—
,,	Merowe	13,816	—
,,	Shendi	24,351	—
,,	Wadi Halfa	102,875	—
UPPER NILE	Malakal	176,986	—
TOTAL		6,379,799	246

SANITARY CONTROL OF AIRCRAFT.

Inspection and disinsectisation of aircraft has been centralised on Khartoum except where aircraft make a nightstop at an airport near the frontier. On the west to east air route from West Africa these measures are carried out at Geneina and again at Khartoum. All passengers entering the Sudan from the west must be in possession of a certificate stating that they have not been exposed to the risk of infection with yellow fever during the previous six days.

The following inspections were carried out during the year :—

Khartoum	774	Juba	114
Malakal	262	Geneina	116

At Khartoum no mosquitoes of any kind were found on aircraft during the year. During 1939, 433 telegrams were despatched by the public health authorities of Khartoum to Egypt, India, and other parts of Africa in connection with the control of yellow fever.

At Geneina one infection of anopheles was found on an eastward bound machine.

STAFF.

The establishment of British Public Health Inspectors was increased from 12 to 13, increasing the number at Khartoum Province from 4 to 5.

Two Public Health Officers passed the examination of the Royal Sanitary Institute in December making 13 in this cadre since its institution in 1934.

The establishment of 62 posts of sanitary overseers in the Northern Sudan is complete, but lack of suitable local candidates makes progress slow in the Southern Sudan.

THE HEALTH AND SANITATION OF PROVINCES.

KHARTOUM PROVINCE.

Area 5,700 square miles. Population 255,488.

GENERAL.

The rainfall was low and the Nile flood only of moderate height.

There was a " carry-over " of malaria into the month of January and February following the unusual conditions of 1938 and, but for one localized outbreak of relapsing fever, the Province was free from major epidemics.

VITAL STATISTICS.

The figures presented below do not claim to be exact but, having been collected in the same way as in previous years, they provide a useful year-to-year comparison. Figures in brackets are those of the previous year.

POPULATION.

The following table gives the estimated population of the Province and of its four districts.

		Men.	Women.	Children.	Total.
(a) Khartoum	1939	16,094	13,899	16,318	46,311
	1938	16,017	13,434	15,218	44,669
(b) Khartoum North	1939	5,266	4,833	5,231	15,330
	1938	5,791	4,515	5,057	15,063
(c) Omdurman	1939	28,159	36,607	52,275	117,041
	1938	28,619	37,147	50,430	116,196
(d) Rural District	1939	20,830	20,324	35,652	76,806
	1938	20,739	20,229	35,499	76,467
(e) The whole Province	1939	70,349	75,663	109,476	255,488
	1938	70,566	75,625	106,204	252,395

There is no conspicuous change in these figures.

The following table shows the population by race :—

	British	Greek	Other Europ.	Egyptians & Syrians	Armenians.	Natives of the Sudan	All Others.
1939	724	*1,838	†232	5,314	328	245,113	1,939
1938	800	1,481	240	5,482	409	242,451	1,941

The fall in the number of British is presumably due to the absence of wives and children.

The following figures are not included in the tables above :—

1. The average strength of British Troops.
2. The average strength of Sudan Defence Force Troops.
3. The average strength of prisoners in the Central Prison 363 (387).

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* Includes Cypriots.

† Includes Americans.

BIRTHS AND DEATHS.

The registered births were 4,690 (4,617) or 73 more than in 1938 and the deaths 2,329 (3,111) or 782 fewer. The number of deaths at 2,329 is closer to that of 2,454 in 1937. The increase to 3,111 being associated with unusually heavy rains and high Nile flood in 1938.

The excess of births over deaths was 2,361 (1,506) giving a natural increase rate of 9.2 (6) per thousand living.

Births. In the following tables births are live births only.

	Male	Female	Total
(a) British	3 (5)	1 (3)	4 (8)
(b) Greek	11 (11)	8 (5)	19 (16)
(c) Other Europeans	3 (6)	7 (5)	10 (11)
(d) Egyptians and Syrians	97 (124)	98 (109)	195 (233)
(e) Natives of the Sudan	2238 (2229)	2153 (2077)	4391 (4306)
(f) All Others	30 (23)	41 (20)	71 (43)

These figures yield the following rates for those settled in the Sudan :—

1. Egyptians and Syrians	36.6 (43)
2. Natives of the Sudan	18 (18)

Birth Rate by Localities.

(a) Khartoum	21 (22)	(c) Omdurman	17 (17)
(b) Khartoum North	37 (38)	(d) Rural District	15 (14.5)
(e) The whole Province	18 (18)		

These figures suggest that birth registration in the Rural District is not complete ; this is to be expected, however, seeing that an appreciable proportion of the people are nomadic Arabs.

There is no obvious explanation for the difference in birth rates between Khartoum North and Omdurman (both are "native" towns) other than faulty population estimation ; in both towns birth registration by trained licenced midwives must be practically complete ; a birth rate of 37 is more likely than one of 17 and the population of Omdurman is probably smaller than the recorded figure.

Still Birth Rate by Localities.

(a) Khartoum	45 (40)	(c) Omdurman	28 (29)
(b) Khartoum North	26 (27)	(d) Rural District	16 (10)
(e) The whole Province	28 (24)		

These rates—except that of Khartoum—are low and, although there is not the usual year-to-year fluctuation, nevertheless the Khartoum rate is probably the only accurate one.

Deaths.

Death rate by Localities.

(a) Khartoum	11.3 (16)	(c) Omdurman	10 (13)
(b) Khartoum North	16 (23)	(d) Rural District	5 (7)
(e) The whole Province	9 (12)		

As already pointed out the population figure of Omdurman is probably too high making the death rate very low.

The actual number of deaths is probably correctly registered. In the Rural District, however, little reliance can be put on either the population or death figures. In Khartoum and Khartoum North, the death rate probably fairly closely reflects the true position.

Seasonal Death Rate.

There is a considerable variation in the number of deaths from month to month and from year to year and also in the death rates. This may be due to the actual numbers being relatively small or to the fact that the population of the Province is still susceptible to varying climatic conditions, epidemics, etc.

Dividing the number of deaths in 1938 and 1939 into two groups, *i.e.*, for the first half and for the second half of each year we have the following figures :—

	1938	1939
1st half	1,214	1,146
2nd half	1,897	1,183

These figures suggest that like conditions held sway during the first half of these two years but that there were some adverse factors operating in the second half of 1938. From the end of June, 1938 there were very heavy rains and the peak of the Nile flood was very high in September. This suggests that with the organization at our disposal we are as yet unable to deal fully with such truly abnormal conditions as those of the second half of 1938.

Deaths by age periods.

Age Period	0-1	1-5	5-10	10-20	20-40	40-60	Over 60
Deaths	279 (323)	274 (767)	85 (116)	130 (149)	372 (398)	295 (288)	782 (1070)
Percentage	11.9 (10.4)	11.7 (24.6)	3.2 (3.7)	5.5 (4.8)	15.9 (12.8)	12.6 (9.3)	33.5 (34.4)

It is noteworthy that the high percentage in the age group 1-5 of 1938 has fallen from 24.6 to 11.7 It suggests that in adverse years the brunt falls on this age group and that even in good years it still has a very high mortality. In England and Wales the percentage in this group is about 2.5 only, although, of course, the population constitution is not necessarily comparable.

Causes of Death in the age group 1-5 :—

1.	Diarrhoea and Dysenterics	130	47%	(48%)
2.	Pneumonia and Bronchitis	54	19.7%	(25%)
3.	" Fever " (probably mostly malaria)	32	11.6%	(17%)

Other causes such as typhoid fever, tetanus, etc., are too varied to be usefully classified.

The importance of the " dirt " diseases (diarrhoea, dysenteries) as a cause of death in early life is again clearly shown.

Infant Mortality Rate.

(a) Khartoum	60 (78)
(b) Khartoum North	65 (71)
(c) Omdurman	81 (92)

These rates are all very low ; that for Khartoum North stood at 102 in 1937. England and Wales had a rate of 57 in 1935. It seems possible that the age has been incorrectly shown on some death certificates.

Certification of Causes of Death.

In the following table the causes of death were certified by a medical practitioner.

		Number	Percentage.
1.	Pneumonia	77 (170)	11.3 (22)
2.	Heart Disease	66 (58)	9.6 (8)
3.	Old Age	65 (27)	9.5 (—)
4.	Diarrhoea and Dysentery	60 (120)	8.8 (17)
5.	Septic Conditions	57 (36)	8.3 (—)
6.	Tuberculosis	47 (42)	7 (6)
7.	Kidney Disease	42 (26)	6 (—)
8.	Violence (Misadventure)	34 (57)	5 (8)
9.	P. U. O.	27 (18)	
10.	Acute Meningitis	22	
11.	Malaria	20	
12.	Typhoid Fevers	19	
13.	Liver Diseases	15	
14.	Malignant Disease	14	
15.	Marasmus		
16.	Difficult Labour (includes complications of pregnancy)		
17.	Cerebral Haemorrhage	12	
18.	Intestinal Obstruction	12	
19.	Nervous Diseases	11	
20.	Kala Azar	5	
21.	Relapsing Fever	4	
22.	Diabetes		
23.	Diphtheria		
24.	Tetanus	3	
25.	Syphilis	2	
26.	Hydrophobia	1	
27.	Rheumatic Fever		
28.	Pertussis		
29.	Beri-Beri		
20.	Various	27	
		682	

The cause of death is not always clearly shown on these certificates and classification, except for the few well known killing diseases, is by no means simple.

The first eight causes of death are the same as those in 1938 although the order is somewhat changed. Such a list, although it may not show a true picture of the causes of death in the whole population, yet gives a useful year-to-year comparison. It will be seen that pneumonia, although it still heads the list, has dropped from 22% to 11.3%; again, the diarrhoeas and dysenteries have fallen from second to fourth place and from 17% to 8.8%.

It is interesting to note that in 1938—a year of much malaria—only eight deaths were attributed to this disease whilst in 1939 there are 20.

Tuberculosis is responsible for 7% of the deaths—a high figure.

Causes of Death under One Year.

This table is compiled from the certificates given by medical practitioners for 53 children who died under the age of one year.

		No.	%
1.	Pneumonia	14 (34)	26 (44)
2.	Diarrhoea	11 (23)	21 (30)
3.	Prematurity, Debility, Malformation	11 (7)	21 (—)
4.	Syphilis	2 (4)	—
5.	Other Causes	15 (10)	—

Here again it is seen that pneumonia and the diarrhoeas are the chief causes of death in infancy—although the ill defined group including prematurity, "debility" etc., is responsible for a larger number of deaths than in 1938.

In Omdurman alone (where the infant mortality seems usually to be higher) an analysis of the causes of death gave the following figures :—

1.	Diarrhoea	9	= 24%
2.	Pneumonia	8	= 22%
3.	Malformation, Debility, etc.	5	= 13.5%
4.	Other Causes	15	= —

There is no difference in the first two causes of death in these two small series.

COMMUNICABLE DISEASES.

There was a " carry-over " of malaria into the first two months of the year from 1938.

There were 226 reported cases of malaria locally contracted in the Three Towns as compared with 731 in 1938 and 149 in 1937.

A localized outbreak of relapsing fever occurred in Shambat and there were 44 cases of cerebrospinal meningitis in Omdurman.

The dysenteries and enteric fevers presented fewer cases than in 1938.

Disease.	Khartoum Local Cases	Khtm. North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural District Cases	Imported Cases	Relapsed Cases	GRAND TOTAL
Chicken Pox	22	16	9	47	30	3	—	80
Diphtheria	7	9	5	21	3	2	—	26
Malta Fever	1	—	—	1	—	—	—	1
Meningitis, Cerebrospinal	5	—	44	49	9	6	—	64
Relapsing Fever	1	1	6	8	100	18	—	126
Small Pox	2	1	—	3	2	—	—	5
Ancylostoma	—	—	—	—	—	1	—	1
Bilharzia	—	—	1	1	8	11	—	20
Amoebic Dysentery	15	6	89	110	1,645	27	2	1,784
Bacillary Dysentery	12	6	7	25	17	—	—	42
Enteric Fever	18	13	55	86	5	14	—	105
Hydrophobia	1	—	—	—	—	—	—	1
Kala Azar	—	—	—	—	—	7	—	7
Leprosy	—	—	2	2	5	15	—	22
Malaria	99	60	67	226	6,992	184	389	7,791
Measles	14	1	6	21	275	2	—	298
Mumps	—	—	3	3	775	1	—	779
Puerperal Fever	—	—	—	—	3	—	—	3
Soft Sore	—	—	—	—	47	—	—	47
Syphilis	—	—	—	—	1,165	—	—	1,165
Pulmonary Tuberculosis	25	4	23	52	30	78	—	160
Non-pulmonary ,,	2	2	10	14	10	11	—	53
Whooping Cough	5	1	9	15	1,012	1	—	1,028

BILHARZIA.

There were 20 cases diagnosed ; of these 11 were imported, one seemed to be a case locally contracted in Omdurman and 8 came from the Rural District.

CHICKEN POX.

80 cases, three being imported. There were no deaths.

DIPHTHERIA.

There were 26 (34) cases notified with two deaths, both in children under five years of age.

Of the 26 cases, 22 occurred in the age period 0-15 years and 13 were under five years of age.

DYSENTERIES.

(*a*) *Amoebic.* In all there were 1,784 (1,541) cases reported, 1,645 coming from the Rural District. (It must be understood that a certain diagnosis cannot be made in the dispensaries of the Rural District).

The Three Towns notified 110 (131) cases, Omdurman providing 89 (107) of them.

As pointed out in previous reports, so again in 1939 the distribution of these cases on a population basis gives Omdurman 72 ; while applying the disease rate of Khartoum to Omdurman, there would be only 38 cases. That, in fact, there were 89 cases notified points to the prevalence in Omdurman of this chronic, disabling disease.

It is curious to note that, whilst in 1938, 82 cases in 131 were of the female sex now, in 1939, 88 cases in 110 are of the male sex.

Incidence by Race.

	British	Egyptians & Syrians	Greek	Sudanese	American	Armenian	Others.
1939	3	6	1	91	1	2	6
1938	3	10	5	110	—	—	—

The disease seemed to fall most heavily on young adults 41 cases occurring in the age period 15-25 years.

(*b*) *Bacillary.* There were 25 (40) notified in the Three Towns and 17 from the Rural District.

Incidence by Race.

British	16	(30)
Egyptians	—	(1)
Sudanese	9	(19)

Here it is seen that the incidence falls most heavily on the British, who must be considered to be particularly susceptible to this disease. Of the 25 cases, 16 were in the age group 15-35, where last year there had been 34 of 50 cases. It should be remembered that many of the British community are in this age group.

Causal Organism.

B. Flexner	11	(29)	B. Schmitz	2	(—)
B. Shiga	3	(2)	B. Sonne	1	(—)
Not defined	8	(19)			

ENTERIC FEVERS.

There were 86 (95) cases notified in the Three Towns, 5 from the Rural District and 14 imported cases. Of these cases 18 (27) occurred in Khartoum, 13 (4) in Khartoum North and 55 (64) in Omdurman. There were 14 deaths giving a mortality rate of about 13% compared with 7% of 1938.

Incidence by Race.

Greek	4	(—)
Egyptians and Syrians	6	(3)
Natives of the Sudan	95	(104)

Incidence by Sex.

67 cases (67) occurred in males.
38 ,, (41) ,, ,, females.

Age Incidence.

1-5	5-15	15-25	25-35	35 and Over
8 (16)	46 (46)	23 (33)	8 (8)	4 (5)

There seems to be a well-marked susceptibility to the disease in the early years of life.

Bacillus Typhosus was the common organism found, 104 cases (one case being "clinical typhoid") whilst in 1938, among 108 cases 106 were due to B. Typhosus, one being B. Paratyphosus "A" and one a "clinical" case.

LEPROSY.

22 (29) cases were seen, 15 being imported. Of the local cases, five were reported from the Rural District and two from Omdurman. Thirteen patients returned home, three went to the Gedaref Leper Settlement, five remained under treatment and one died.

During the last 10 years 184 cases of leprosy have been notified, 105 being imported cases and 79 local. Twenty two have died, 108 returned home, 11 were sent to Gedaref, 20 remain under treatment, whilst 9 are "burnt-out" cases, leaving 14 untraced.

MALARIA.

The rainfall was about normal in amount (119.1 mms.) whilst the Nile flood (15.48 ms.) was scarcely up to normal level.

Cases of malaria continued into the first two months of the year but there was then a sharp fall in the incidence of the disease

In all 7,791 (23,721) cases were reported in the Province.

In the Three Towns there were 226 (731) primary locally contracted cases notified. Of these Khartoum provided 99 (331), Khartoum North 60 (181) and Omdurman 67 (219). In 1937 the figures were 89, 24 and 36 respectively and they suggest that Khartoum and Khartoum North suffer more severely from malaria than Omdurman.

Primary Cases (in the three towns) by Race.

British	Greek	Egyptians and Syrians.	Natives of the Sudan.
101	1	5	119
(294)	(7)	(31)	(392)

Type of Parasite.

Malignant Tertian	169 (549)	Quartan	2 (3)
Benign Tertian	49 (141)	Not Defined	6 (33)

These figures show that 77% of the cases were due to M.T. in 1939 and 79% in 1938.

The British Troops supplied 85 (248) cases of the total 226.

MEASLES.

There were 298 cases reported, 23 cases occurring in the Three Towns.

CEREBROSPINAL MENINGITIS.

Cases of meningitis began to appear in April and, although the disease never grew to epidemic proportions, yet 64 cases were notified with 13 deaths—a mortality rate of 20% which is low compared with previous years when M & B 693 was not used in treatment.

There were 5 cases notified in Khartoum, 44 in Omdurman, 9 in the Rural District and 6 imported.

Of the 49 cases in the Three Towns, 43 occurred among natives of the Sudan, 5 among Egyptians and Syrians whilst one was British. As to age incidence 24 or 50% were in the age group 5—15 years. 38 were males and 11 females.

MUMPS.

779 cases were reported, 775 coming from the Rural District. The disease generally ran a benign course, orchitis in young males being an uncommon complication.

RABIES.

There was one case presumed to be locally contracted in Khartoum and admitted to hospital moribund. The patient had not received a course of injections and the animal responsible (a dog) was not recovered.

RELAPSING FEVER.

There was a localised outbreak of relapsing fever in Shambat Village during the end of March and April.

Altogether 104 cases were treated and there was no death. Of 104 cases, 49 were men, 36 women and 19 children ; there were among these cases 65 positive blood slides and the remaining 39 were diagnosed on clincial grounds.

The source of infection was later traced.

In addition to the outbreak at Shambat four locally contracted cases occurred in the Three Towns (two in Omdurman and one each in Khartoum and Khartoum North). There were also 18 imported cases.

SMALLPOX.

Five cases were notified, two coming from Khartoum, two from the Rural District and one from Khartoum North. There was one death.

The usual measures were undertaken and altogether 26,616 vaccinations were made during the year.

VENEREAL DISEASES.

These diseases are notifiable and in 1939 an attempt was made to render notification more effective.

(a) Syphilis. A total of 157 new infections were reported.

Among 95 prisoners admitted to the Central Prison in 1939, 7 were found to have positive Kahn tests.

(b) Soft Sore. 22 cases were reported.

In addition to these cases, the following were reported from the Rural District dispensaries :—

Syphilis 1165 cases, Soft Sore 47 cases, Gonorrhoea 379 cases.

TUBERCULOSIS.

195 (188) cases of tuberculosis were notified in 1939 and of them 160 (124) were pulmonary and 35 (64) " non-pulmonary " forms of the disease.

There has been a gradual increase in the number of cases notified during the last few years as shown in the following table :—

	1934	1935	1936	1937	1938	1939
Cases notified	142	165	143	175	188	195

These figures include " imported " cases.

In 1939 the deaths certified as being due to tuberculosis among 682 death certificates were 47 or 7% (6%).

In 1938 there were 55 " local " cases of phthisis with 19 deaths and in 1939 57 cases with 25 deaths.

These patients are, of course, mostly poor and so live in overcrowded houses and are unable to work or only capable of light work ; thus the " house contacts " of these patients are exposed to grave risks of infection.

The examination of " house contacts " was continued throughout 1939 and we offered such help and advice as we could to the households.

Cases by Sex.

	Pulmonary.	Non-Pulmonary.
Males	109 (108)	13 (33)
Females	21 (16)	12 (31)

Cases by Race.

	Egyptians	Abyssinians	Yamani	Burgu	Sudanese	Greek
Pulmonary	1 (3)	3 (2)	1 (1)	4 (—)	120 (112)	1 (—)
Non-pulmonary	1 (—)	— (—)	— (1)	— (—)	24 (56)	— (—)

Cases by Age Period.

	1-5	5-15	15-25	25-35	35-45	45-55	55-65	Unknown
Pulmonary	— (—)	2 (—)	44 (27)	54 (45)	14 (27)	8 (11)	6 (6)	2 (2)
Non-pulmonary	1 (1)	8 (11)	7 (16)	5 (22)	1 (8)	2 (3)	— (2)	1 (1)

These figures show strikingly how the disease falls most heavily on those in young adult life. In 1938, of 124 cases of phthisis 99 cases occurred in the age period 15-45 *i.e.* the working years of life and in 1939 of 130 cases 112 fell in this age period.

Again in 1938 males provided 108 of 124 cases and in 1939, 109 of 130 cases.

Thus it will be seen that the family wage earner (*i.e.* the young adult male) appears to be most often affected.

Cases by Occupation.

	Pulmonary	Non-pulmonary
Shop keepers and Artisans	23 (26)	— (4)
House servants	14 (5)	1 (1)
Labourers	9 (16)	2 (1)
Clerks	4 (10)	— (1)
Cultivators....	14 (19)	— (5)
Soldiers, police, orderlies	6 (4)	— (—)
Car drivers	1 (2)	— (1)
Hospital attendants	— (6)	— (—)
Indigent, unemployed, etc.	21 (14)	3 (11)
Others	13 (6)	— (3)
Women	21 (16)	12 (25)
Children under 15	4 (—)	7 (12)

In the years 1931-1938, 778 cases of pulmonary tuberculosis were notified (*i.e.* local and imported cases).

Of these cases, 227 had left the district and 66 could not be traced in December 1939, leaving 485 cases whose fate is known. Only 97 were found to be alive, 388 having died. Indeed this figure of 388 is probably too low since it seems likely that some of the 66 untraced cases had also died.

THE FOLLOWING TABLE SHOWS THE RESULT OF A FOLLOW-UP OF 778 CASES OF PULMONARY TUBERCULOSIS NOTIFIED BETWEEN 1931 TO 1938.

Year of Notification.		No. of Cases	Died	Condition in December, 1939.			Total
				Left District	Alive in District	Untraced	
1931	Local	30	21	4	1	4	69
	Imported	39	16	19	—	4	
1932	Local	56	39	10	4	3	96
	Imported	40	22	15	—	3	
1933	Local	56	41	7	6	2	100
	Imported	44	19	23	1	1	
1934	Local	49	37	6	4	2	83
	Imported	34	9	21	2	2	
1935	Local	63	44	5	10	4	104
	Imported	41	15	22	1	3	
1936	Local	51	23	7	17	4	95
	Imported	44	15	13	1	15	
1937	Local	54	33	5	10	6	102
	Imported	48	11	23	3	11	
1938	Local	55	19	10	24	2	129
	Imported	74	24	37	13	—	

THE FOLLOWING TABLE SHOWS THE RESULT OF A FOLLOW-UP OF 415 CASES OF NON-PULMONARY TUBERCULOSIS NOTIFIED BETWEEN 1932 AND 1938.

Year of Notification.		No. of Cases	Died	Condition in December, 1939.			Total
				Left District	Alive in District	Untraced	
1932	Local	25	9	3	8	5	36
	Imported	11	1	7	2	1	
1933	Local	56	17	7	23	9	76
	Imported	20	1	13	1	5	
1934	Local	41	15	6	16	4	58
	Imported	17	2	13	—	2	
1935	Local	44	13	5	20	6	61
	Imported	17	3	12	2	—	
1936	Local	36	11	3	16	6	48
	Imported	12	1	4	5	2	
1937	Local	45	14	5	17	9	72
	Imported	27	2	12	—	13	
1938	Local	40	8	4	24	4	64
	Imported	24	3	15	2	4	

WHOOPING COUGH.

There were 1,028 cases reported. The disease was not as severe as it had been in 1938.

PNEUMONIA.

In 1939 the new drug M & B 693 was used to some extent in the treatment of pneumonia.

The following table gives the number of cases treated in the five hospitals of the Three Towns :—

1938			1939		
Cases	Deaths	%	Cases	Deaths	%
419	113	27	256	57	22

It will be seen that the mortality rate has fallen from 27% to 22% but that there were only a little more than half the cases treated in 1939 and that the deaths from pneumonia were just about half.

It was shown on page 31 that pneumonia was the cause of 11.3% of the deaths (among 682 certified by medical practitioners) as compared with 24% among 695 deaths in 1938 but this difference in percentage could be accounted for by the actual difference in the number of deaths.

KHARTOUM NORTH CENTRAL PRISON.

The average daily strength of the prisoners was 363 (367) excluding patients of unsound mind who are cared for in a special compound.

The general health of the prisoners was good.

There were 151 (150) admissions to the prison hospital from the Central Prison and 68 (56) from other local prisons.

Of the cases treated in hospital, 43 (87) were malaria but, of these only 21 came from the Central Prison.

There was only one case of mumps and three of the dysenteries.

During May and June, 27 cases of chickenpox occurred.

Towards the end of September and during October, cases resembling influenza appeared—some were complicated by bronchitis and a few by pneumonia.

95 prisoners admitted to the prison during the year gave 7 positive Kahn tests.

The patients of unsound mind kept in good bodily health and were given a fair measure of liberty—several working in the shops. Three were transferred to local prisons.

The reformatory held a varying number of "juveniles" for whom special work and instruction was provided.

No case of the deficiency diseases was detected and the prisoners presented generally a picture of physical well-being.

EXAMINATION OF SCHOOL CHILDREN.

Towards the end of the year a Medical Officer was posted as an Assistant to the Medical Officer of Health and his work has been mainly with the schools. A School Dentist was appointed at about the same time.

During the year 38 schools were inspected and 6,646 boys and girls examined.

The general condition of the children was good : trachoma, defects of the teeth and of vision being the chief maladies found.

The 38 "schools" were made up as follows :—

2	Colleges	851 boys.
8	Intermediate Schools	1,388 ,,
25	Elementary ,, ...	3,838 ,,
3	Girls ,, ...	569 girls.

The results of examination of the school children are much the same as in the last few years. Active trachoma has fallen by some 2% over last year.

	1936		1937		1938		1939	
	No.	%	No.	%	No.	%	No.	%
No. examined	2,814		5,601		6,169		6,646	
Trachoma	1,055	39.5	2,074	37.0	2,612	42.0	2,777	40.0
Defective vision	233	8.0	245	4.0	892	14.0	634	9.8
Dental defects	267	9.0	559	10.0	944	15.0	1,390	20.0
Splenomegaly	53		152		154		191	
Diseases of the Nose and Throat	64		167		496		285	
Cardiac defects	26		22		36		85	
Diseases of Lungs (not tuberculosis)	9		5		15		7	
Skin Diseases	24		7		55		98	
Bilharzia	—		—		—		10	
Other Conditions	29		55		—		255	

Trachoma appears to be commoner among elementary school boys and tends to die out during school life ; it may be associated with the lower standard of living in the families of elementary school boys or it may run its relatively benign course more swiftly by reason of the treatment meted out by the school dressers ; in any case active trachoma becomes less common as the school age advances.

Dental caries was more carefully considered and the School Dentist treated 97 boys, making 161 stoppings, 63 extractions and 21 scalings. Simple extractions were made by the School Medical Officer at the school itself ; likewise certain other forms of treatment (227 cases) were carried out.

Defects of Vision. Such cases were referred to the Ophthalmic Surgeon for the prescription of lenses, etc.

An attempt was made to assess a " state of nutrition " but obviously this clinical observation—taking into account as it does many varying factors—needs some experience and basically the establishment of a local standard. Further the children examined present wide racial differences. In one school the Medical Officer felt 20% of the boys showed some degree of malnutrition, he also found the splenic index to be relatively high (*i.e.* 6%).

Enlarged livers are not uncommonly found especially among the school children of Omdurman ; the aetiology is obscure.

The cases of bilharzia were all imported.

A gradual programme of improvement of school buildings is slowly going forward ; particular attention has been paid to overcrowding and defective ventilation.

We also examined 4070 (2880) boys in village schools and undertook as far as possible the treatment of trachoma and of any urgent conditions.

	Number		%	
	1938	1939	1938	1939
Number examined	2,880	4,070	—	—
Trachoma	3,228	2,003	80%	70%
Spleen	179	435	0.7%	6.2%
Albuminuria	129	196	3%	6.8%

These figures are not yet " stabilised " as village schools in new areas (Rural District) were examined systematically for the first time.

The following table shows the percentage of active trachoma found amongst students of the Gordon Memorial College during the past eight years :—

YEAR.	%
1932	85
1933	61
1934	48
1935	24
1936	22
1937	23
1938	17
1939	21

MOSQUITO CONTROL.

This work was carried out generally along the same lines as in other years.

Number of Infections.

Year	Khartoum District	Omdurman	Khartoum North	Rural Dist.	Total	COST		
						Cost of Labour.	Larvicides	£E. Total
						£E.	£E.	
1939	1,406	854	1,883	1,777	21,920	2,761	1,008	3,769
1938	3,105	2,108	1,427	23,350	29,990	2,966	1,545	4,511

Only in Khartoum North District was there an increase, other areas showed a substantial decline and there is reason to suspect that this increase is not a real one but only due to closer methods of inspection and recording. In 1939 64% of all infections found were anopheline as compared with 58% in 1938.

More and more anopheline "infections" are found every year, not only in Khartoum itself but throughout the Province. This change in constitution of the mosquito population may depend in some part on the ever growing pump and garden cultivation in the Province.

There were four Aedes "infections" found, of which one only was confirmed by the Medical Entomologist.

Steamers, trains and aircraft were inspected and "demousticated" as needed. No mosquito was found on any aircraft and it may truly be said that thorough measures were taken at the frontier stations.

BLOOD TRANSFUSION.

A number of volunteers among the long term prisoners in the Central Jail were again "grouped."

This pool of blood, ready at short notice, is of considerable service to the hospitals in emergency work.

AIR RAID PRECAUTIONS.

During the year many volunteers were given some training in elementary first aid and an emergency medical service was organised.

KHARTOUM.

CLIMATOLOGICAL SUMMARY—1939.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean Maximum °F	91.6	94.8	101.5	107.4	109.4	108.7	103.5	99.9	102.2	105.3	99.5	95.9
,, Minimum °F	60.4	61.5	67.1	73.2	79.7	80.2	79.2	78.3	78.1	77.9	69.8	65.5
,, Temperature °F	68.9	75.6	81.9	88.3	93.0	92.3	89.6	86.7	88.0	89.6	82.0	78.4
Total Rainfall (mms)	—	—	—	3.5	12.2	Trace	19.1	43.1	18.4	22.8	Trace	—
Prevailing Wind Direction ...	NE	NE	NE	NE	SW	SW	SW	SW	SW	NE	NE	NE
Mean Relative Humidity ...	31	25	23	21	29	31	45	55	51	43	34	41

NORTHERN PROVINCE.

Area 236,200 square miles—Population 514,143.

The public health of the province remained satisfactory. There were no serious epidemics and in spite of the high Nile flood of 1938 the incidence of malaria remained low. Harvests as a whole were plentiful, and the economic condition of the people remained satisfactory. The local authorities continued to assist in matters of public health both in towns and rural areas, and the resiting of the villages on higher ground away from the insanitary conditions on the edge of the river continued gradually. Progress was made in slum clearance in the towns notably Wadi Halfa and is resulting in a far higher standard of cleanliness. Dongola town which is backward in this respect suffered from a high incidence of amoebic dysentery.

GEZIRA PROVINCE.

(Combining Blue Nile and White Nile Provinces.)

Area 54,605 square miles—Population 1,388,485.

The public health of the province was satisfactory throughout the year. Apart from small outbreaks of relapsing fever in the Wad Rawa district and near Kosti and one small outbreak of smallpox in the Fung Area, there was no epidemic disease. The smallpox was imported from Italian East Africa. The aftermath of the outbreak of malaria in 1938 showed itself in the spring of 1939 when the incidence of malaria was above average. It fell to normal in March and from then until the end of the year the situation as regards malaria in the Gezira and the White Nile area other than the Gebel Aulia Reservoir was better than it had been for many years. This had a very favourable effect on the general health of the province and showed itself by a considerable reduction in the numbers of inpatients in the latter part of the year in most hospitals. There are indications however that the incidence of malaria has increased in the part of the White Nile area affected by the Gebel Aulia Reservoir.

The food situation in all areas, apart from the Southern Fung, was satisfactory. Locusts made their appearance in the Gezira area in June and at that time it looked as if the situation might be serious. After the first wave however they disappeared and the crops, some of which had to be resown, were saved. The Southern Fung was not so fortunate and the people showed signs of malnutrition.

KASSALA PROVINCE.

Area 134,450 square miles—Population 425,220.

The general health of the province was satisfactory and the incidence of malaria was the lowest for many years. Quarantine measures were tightened up for the control of relapsing fever and fewer cases were reported. There was a decrease in the number of immigrants from Italian East Africa. No cases of smallpox occurred during the year but large scale systematic vaccination was carried out as a precautionary measure. The incidence of venereal disease remains high and efforts are being made in collaboration with the civil authorities to deal with this difficult problem more effectively. Considerable improvement has been effected in the anti-malarial work. The harvests were adversely affected by the poor rainfall and sparrows caused some damage but locusts were absent. At the beginning of the rains there was a certain amount of sub-nutrition among the nomad tribes in parts of the southern district which was remedied by an issue of grain by the local authorities.

PORT SUDAN.

Population 26,255.

The public health of Port Sudan was satisfactory during the year. There were no epidemics except chickenpox. The incidence of amoebic dysentery remains high.

Sanitation.

The installation of water flush latrines with septic tank system in place of buckets was continued.

Anti-Mosquito Work.

Since December 1937 every house in the town has been inspected once a week by a member of the sanitary staff for mosquitoes and to enforce cleanliness. As a result the incidence of *Aedes aegypti* infections found has now dropped to negligible proportions, and Port Sudan is considerably freer from flies which should have a beneficial effect on the future incidence of amoebic dysentery.

Rat Control.

The number of rat catchers and traps in use has been increased and as a result the number of rats caught has increased three fold in four years. The number of fleas per rat appears to be decreasing. This is also the case in Suakin where when rat catching was first organised the number of fleas per rat was 4.5 compared with 1.75 at the present time.

Warehouses at Port Sudan are now all well rat-proofed and most of the corrugated iron sheds have had the lower six feet of the walls replaced by concrete. Rat guards are compulsory for ships moored against the quays.

The total number of rats caught during the last five years is as follows :—

1935	1936	1937	1938	1939
6,134	5,302	8,499	12,215	16,518

Of the 16,518 rats caught this year :—

4,716 were *Rattus rattus rattus.*
5,238 ,, ,, ,, *alexandrinous*
6,564 ,, ,, ,, *frugivorous.*

Rat Fleas.

The flea census per month together with the prevailing atmospheric conditions was as follows :—

MONTH.	Fleas per rat.	Average Temperature Shade		Average Relative Humidity.
		Maximum °C.	Minimum °C.	
January	.8	30.6	16.2	52
February	.8	30.0	15.3	43
March	.8	31.0	17.9	38
April	.9	34.3	23.2	33
May	.7	42.7	26.6	37
June	.9	46.2	24.1	41
July	.8	47.3	25.2	53
August	.8	44.2	27.3	62
September	.9	41.5	24.8	61
October	.9	38.1	23.7	53
November	.8	34.1	20.7	48
December	.8	34.0	14.7	50

Water Supply.

The excellent quality of water from Khor Arbaat was maintained throughout the system.

KORDOFAN PROVINCE.

Area 147,600 square miles—Population 1,313,062.

The public health of the province was satisfactory, and no serious epidemic occurred. Minor outbreaks of mumps, measles, and influenza were reported, and sporadic cases of relapsing fever occurred. 55,528 persons were vaccinated, and 46,230 deloused during the year. The rainfall was above average but good spacing accounted for a decrease in the number of mosquitoes. Grain shortage occurred in certain districts but no undue increase in the sickness rate as a result has been reported. Malaria which is the most important factor adversely affecting the public health of the province showed a decreased incidence except in eastern Kordofan where climatic conditions accounted for an increase in incidence. A steady improvement in sanitation has been maintained and increased cleanliness has been observed in the towns but the indifference of the older generation has still to be overcome. The officials at Kadugli and the school children in Dilling organised voluntary assistance in mosquito destruction. The teaching of hygiene in the schools is being actively carried out and public lectures are given. In 1939 further legislative measures in the interests of public health were enacted.

DARFUR PROVINCE.

Area 138,150 square miles—Population 715,543.

Many people in the Province were hungry during the end of the dry season and early rains and much sub-nutrition occurred. It was feared that this would result in the outbreak of epidemic disease but happily this did not occur.

This year grain crops have been good all over the Province and no shortage is anticipated.

There was no marked alteration in the health of the Province. Small outbreaks of relapsing fever occurred in most areas of the province at some time of the year and from August onwards there were several outbreaks of smallpox in Dar Masalit.

Malaria occurs all over the Province ; its incidence is particularly heavy during the rains and the disease is most severe in the south and west.

Tropical ulcer is widely prevalent and the cause of much disablement. Its incidence appears to be associated to some extent with periods of malnutrition during the dry season although these do not manifest themselves until the beginning of the rains. The people are then too busy cultivating to come for treatment with the result that the ulcers have become extensive and have produced much tissue destruction before they are seen. There is much trachoma and trichiasis especially in the towns, among school children. Taenia saginata is a scourge among the sedentary cultivators and the southern nomads. Infection is due to eating raw meat and is present in almost every patient attending hospitals and dispensaries in this area.

Sanitary measures are limited to the larger towns and several improvements in conservancy systems and anti-malarial measures have been made during the year. In addition lectures in mosquito work and the relation of mosquitoes to malaria was given to the police in Fasher by the public health officers. Selected mounted police were then used as mosquito scouts. They patrolled an area of 8 miles surrounding the town and reported infected pools and other breeding places which were then treated by this means. An area of 8 miles around Fasher was controlled as compared with 3 miles last year.

Propaganda talks and demonstrations were given to Sheikhs of quarters and in surrounding villages. It is satisfactory to note that near Fasher the villagers showed interest and voluntarily oiled their own pools expressing themselves pleased with the improvement in conditions.

An experimental public health propaganda scheme has been launched in Zalingei district. The intention is that a whole time sanitary overseer with a knowledge of the local language will tour villages and schools giving instructions and demonstrations in simple village hygiene. There is ample scope for improving the lot of the people in this manner and such a scheme should provide useful information and experience for similar efforts in other districts.

UPPER NILE PROVINCE.

Area 92,270 square miles—Population 520,700.

There has been no change of note in the general health of this province during the year.

Damage by locusts was not as great as was expected and on the whole the harvest was good and the general condition of the people up to average.

Epidemic pneumonia occurred at the end of the year in Western Nuer and Southern Zeraf Island. Accurate figures were not available though a large number of deaths were reported. Owing to their inaccessability in the swamps and the unwillingness of these backward people to seek treatment little could be done to reduce the mortality.

Small outbreaks of chickenpox, influenza, measles and whooping cough also occurred.

A gratifying fall in the number of cases of enteric fever was recorded. Only 4 cases occurred with one death. For a number of years past the average number of cases has been about a dozen while in 1938 there was an outbreak of 46 cases. It is believed that the recent installation of pure water supply has contributed to this improvement.

For over 2 years kala-azar has been present in epidemic form in the Paloich district. There is some evidence that the incidence is abating in this area though from reports received it is feared that the disease is moving south. Investigations on the distribution of sandflies in this area were carried out during the year.

Dracontiasis continues prevalent in the Bor district. The provision of wells in infected areas is proceeding. Treatment of gonorrhoea with sulphonamide preparations has proved very satisfactory. A rapid and efficient cure for the disease is of the greatest importance as a preventive measure in this province, as of recent years there has been evidence of an alarming increase in incidence.

Malaria continues to be the chief endemic disease. 4,571 cases were reported during the year of whom 643 were admitted to hospital.

5 cases of cerebral malaria occurred with 3 deaths.

Mosquitoes were less in number than usual and only one infection of *Aedes aegypti* was found during the year. A purified water supply was installed in Malakal in May and has worked efficiently. There has been a satisfactory sale of water to the public from stand pipes and increased control has been exercised on places on the foreshore appointed for drinking, washing and other purposes.

Some extension was made to conservancy and refuse disposal systems during the year and considerable improvement has been made in the market area of Malakal where much demolition and rebuilding has been carried out.

EQUATORIA PROVINCE.

Area 159,750 square miles—Population 1,192,401.

Progress in the field of preventive medicine continues although the energies of the Medical Staff are still mainly devoted to the curative side. The two outstanding medical events of the past year were the extensive outbreak of measles in the spring and the cerebrospinal meningitis epidemic in the Dinka districts. Apart from the Zande District where the measles epidemic was mild, the rest of the Province was ravaged by the disastrous sequelae of the disease in unprecendented severity. In the Wau District broncho-pneumonia was the main cause of death, but elsewhere severe intractable gastro-enteritis carried off thousands of children. No treatment was found specific and the lack of any suitable invalid diets amongst the native population made village treatment of little avail. Cerebrospinal meningitis which was reported in the Aweil District in 1938—spread during the past year south and east as far as Yirrol. 2,570 cases occurred. Treatment by the new sulphonamide drugs resulted not only in an amazing drop in the death rate of treated cases but earlier notification thus facilitating the control and the limitation of the outbreak. There is little change in the situation as regards endemic disease in the Province. The number of Sleeping Sickness cases remains much as last year. Progress in fly eradication in two areas has been sufficiently encouraging to warrant expansion and the further devolution of inspections to the native authorities has proved satisfactory.

Malaria still remains the major cause of invalidism among northern officials. Blackwater fever it is hoped has disappeared due to better housing and more efficient treatment of malaria.

Syphilis and gonorrhoea are still the scourge of the Zande and allied tribes. Suggestions for a mass campaign of treatment have been considered but is not regarded as practical at the present stage. Improved general education, an increased cadre of trained local medical staff and cheaper medicaments are necessary before such a campaign can be seriously considered. The prevalence of ancylostomiasis appears to be increasing in some areas, in others, the disease is a serious menace to health leading to anaemia, ascites, enlargement of liver and spleen, profound lassitude and is in many cases the indirect cause of death.

Experiments based on the provision of shoes are in progress in two Districts.

Considerable progress has been made in the public health work of the Province. Improved organisation in Juba has enabled the Public Health Inspector to devote more time to Province sanitation. A survey has been made and a programme prepared to deal with the more urgent needs of each District.

A vigorous campaign for the elimination of mosquito breeding places in towns is being pressed. This is effected by the planting of eucalyptus in swamp areas and by careful attention to the smaller breeding places, such as pools in rocks, borrow pits, rain pools, holes in trees, etc.

Conservancy for native lodging areas is an urgent need throughout the Province owing to the almost universal prevalence of hookworm.

A good beginning has been made in Juba and Wau and it is hoped to gradually extend this provision as funds became available.

Experiments are being carried out with a view to instituting two-wheeled hand carts for refuse collection. Labour is cheap and roads are fairly good and it is hoped that these carts will prove a useful innovation.

MATERNITY AND CHILD WELFARE.

MIDWIFERY SERVICE.

20 pupil midwives completed the course of training at the School of Midwives, Omdurman. All conducted at least 20 deliveries and assisted at a further 20 cases. Particular attention was also paid to their instruction in the principles of elementary hygiene, so that on return to their villages they may play their part in the spread of public health propaganda amongst the rural population. Considering that these women are illiterate their development and improvement during the short course of training is encouraging. Given frequent inspection and guidance these candidates should prove useful midwives. Four trained midwives underwent a revision course, conducting a minimum of eight cases.

339 midwives have been trained and registered since the school opened 19 years ago, and of these 266 are still practising.

Their distribution is as follows :—

Khartoum Province	67	Kordofan Province....	35
Gezira ,, ...	50	Darfur ,, ...	9
Northern ,, ...	75	Upper Nile ,, ...	3
Kassala ,, ...	27		

18 of these are also trained nurses.

The work of the town and rural trained midwives is on the whole satisfactory considering the great difficulties and prejudices to be contended with especially in the smaller villages.

The importance of inspection of the work of subordinate staff in order to secure efficiency is fully realized but in the case of midwives this is difficult as it is seldom possible for the local medical authorities to observe a midwive conducting a case. Great value is therefore attached to the annual tour of inspection by the staff of the training school. When possible, at least 24 hours is spent in a village in order that the management of a delivery and the daily nursing of the mother and baby may be seen. Equipment is checked and revision in all branches of the school teaching is given. Where practicable meetings of the local women and notables are arranged so that the ideals of the school and its teaching may be explained in detail.

Many of the midwives assist in the women's work of the local dispensaries, thus enabling them to make contact with the women of the district to explain simple hygiene principles and to encourage them to attend the antenatal clinics.

MATERNAL MORTALITY.

It is only in the towns where the population is entirely served by trained midwives that it is possible to obtain reliable information regarding maternal mortality and the complications of child birth.

The midwives of Omdurman attended 1,984 (1,968) cases 13 (23) being classed as abnormal. 25 (24) patients were transferred to hospital where three died and another died in her home. 67 (70) cases of abortion were treated by the midwives, one being septic and transferred to hospital.

The following statistics are compiled from cases admitted to the hospitals of Khartoum, Khartoum North and Omdurman. These figures cannot be taken as typical of the whole of the northern Sudan, but they give some indication of the risks associated with pregnancy and parturition, conducted under the best available conditions. The figures in brackets are those recorded in 1938.

Total number of live births registered in the three towns—3,511 (3,506).

Total cases attended in Hospital.

(a) Normal	78 (67)	(c) Recovered	262 (218)
(b) Abnormal	198 (162)	(d) Died	14 (11)
(e) Live Births in hospital	121 (107)		

In Khartoum hospital the normal deliveries, 46, exceeded the abnormal 34, in Omdurman hospital the abnormal, 158, were far more than the normal. These differences are most likely due to the great number of Europeans and to the demand for European standards in Khartoum, for it is the native custom for a mother to bear her baby in her own home.

Complications and Causes of Death.

			Total.	Recovered.	Died.
Abortions	Septic	3 (7)			
	Others	82 (85)	85 (92)	85 (90)	— (2)
Puerperal sepsis	Normal labour	13 (13)	20 (20)	18 (15)	2 (5)
	Abnormal labour	7 (7)			
Puerperal haemorrhage	Placenta praevia	4 (10)	11 (17)	11 (17)	— (-)
	* Other causes	7 (7)			
Puerperal albuminuria and convulsions			12 (8)	11 (6)	1 (2)
Other toxaemias of pregnancy			1 (5)	1 (3)	— (2)
Phlegmasia alba dolens .... Embolism			1 (3)	1 (1)	— (2)
Other accidents and abnormal condition of the puerperal state			41 (52)	36 (49)	5 (3)
Illness complicating, but not directly due to pregnancy			49 (39)	42 (37)	7 (2)
			220 (236)	205 (218)	15 (18)

The above figures give the following rates per 1,000 live births but it must be remembered that the figures are very small and wide year-to-year variations are to be expected.

Total Maternal Mortality	(Omdurman)	3.6	(5.14)
Puerperal Sepsis Rate	(Omdurman)	—	(2.06)

(There was only one death in 1939 attributed to Puerperal Sepsis).

Infantile Mortality Rate	(Omdurman)	81	(92)

MATERNAL AND CHILD WELFARE CLINICS.

These clinics continue to serve a most useful purpose and are greatly appreciated by all classes of the native population.

The work is mostly maternal welfare but instruction and help are given in the care of infants during the first few weeks of life. In teaching the value of antenatal, postnatal and infant care, opportunity is taken to show the importance of diet and food values.

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*Four cases of threatened abortion, two cases of accidental haemorrhage and one of secondary postpartum haemorrhage on the seventh day of the puerperium.

Ante-natal clinics are now held in El Obeid, Rufaa, Dongola, Shendi, Kassala, Khatmiah and Gedaref in addition to those in Omdurman, Khartoum and district, Wad Medani, Atbara and Port Sudan which have had good attendances for several years.

At the end of 1937 a separate out-patient department was opened in the Female Block of Juba Hospital for women and children, who up to that date had attended the general out-patient department of the Hospital. In 1939 there were 7,931 attendances among children, of whom 2,003 were new cases as compared with 7,268 and 1,720 respectively in 1937.

Though the progress of ante-natal work has been slow these figures indicate the popularity of medical work amongst children and with the expansion of child welfare work by the opening of a small centre in the local village it is hoped that the mothers will be encouraged to seek advice and thus slowly build up an ante-natal service.

SCHOOL MEDICAL SERVICE.

A further expansion of the School Medical Service took place during the year. 43,505 pupils were examined in 586 schools as compared with 40,340 in 569 schools in 1938.

Periodic inspections of school children and school buildings are made by medical inspectors of provinces. Medical officers and assistants carry out routine examinations and treatment. In Khartoum a whole-time medical officer is now employed on school work while inspection and care of the teeth is carried out by a qualified dental surgeon.

The high percentage of trachoma in the schools of the Northern and Central Sudan is again a feature of this year's examinations.

Insufficient attention has been paid in the past to continuity of treatment. Where treatment is regular and long continued, marked improvement follows. This is clearly evidenced in the results obtained at the Gordon Memorial College where the incidence of the disease has decreased progressively from 85% in 1932 to 21% in 1939. The Government Ophthalmologist again stresses the importance of early treatment in elementary and village schools so that the disability resulting from complications may be lessened.

The incidence of bilharzia continues high in Darfur, Kordofan and Halfa district of the Northern Province, but infected children rarely complain of any symptoms and the disease tends to die out after the age of puberty.

In spite of a good malarial year the spleen rate remained high in most areas. In the south a high percentage of school children suffer from chronic malaria and ancylostomiasis.

During the past year more attention has been paid to the living conditions of pupils. Local improvement has been possible in the provision of new and better dormitories and class rooms, improved water supplies and increased latrine accommodation, but much remains to be done. In Equatoria Province standard regulations governing accommodation, layout and services required have been prepared and circulated to all Government and Mission Schools.

The general standard of health has been satisfactory and no evidence of deficiency disease has been revealed. No case of tuberculosis was discovered among the 43,505 pupils examined.

The following table shows the results of the examinations :—

PROVINCE AND DISTRICT.	No. Exam.	% Tracho-ma	% Bilhar-zia	% Spleen	% Pulm. T.B.	% Ancy-lost.
Darfur Province :—						
4 Elementary	519	48.9	32.7	45.0	—	8.0
7 Village	296	5.1	34.4	45.6	—	0.6
Equatoria Province :—						
JUBA DISTRICT.						
2 Intermediate	204	5.3	0.9	15.6	—	3.9
11 Elementary	977	12.3	1.2	32.1	—	8.7
WAU DISTRICT.						
7 Elementary	549	0.7	4.1	38.4	—	5.4
ZANDE DISTRICT.						
2 Elementary	187	—	21.9	16.5	—	12.8
Gezira Province :—						
GEZIRA DISTRICT.						
2 Intermediate	274	8.4	—	2.1	—	—
1 Girls	174	24.7	—	14.0	—	—
9 Elementary	2,561	27.6	0.2	24.3	—	—
129 Village	7,964	22.2	0.3	25.9	—	—
FUNG DISTRICT.						
4 Elementary	403	21.8	0.7	57.5	—	—
4 Girls	308	27.7	0.6	32.6	—	—
16 Village	565	30.6	1.5	49.2	—	—
WHITE NILE DISTRICT.						
1 Teachers' Train. College	93	36.6	12.9	26.8	—	—
1 Intermediate	68	42.6	11.7	29.4	—	—
2 Girls	189	62.9	5.8	20.6	—	—
6 Elementary	882	25.5	3.6	36.6	—	—
6 Village	293	28.0	2.3	30.7	—	—
Kassala :—						
KASSALA DISTRICT.						
8 Elementary	752	21.01	—	17.4	—	—
16 Village	890	39.1	—	21.2	—	—
PORT SUDAN.						
1 Intermediate	141	14.8	—	7.8	—	1.4
3 Elementary	443	23.7	0.9	6.0	—	—
1 Village	284	41.9	0.7	15.1	—	0.3
Khartoum Province :—						
Gordon College	411	21.0	—	5.0	—	—
Coptic College	440	28.0	—	8.0	—	—
National School	125	52.0	—	3.2	—	—
8 Intermediate	1,388	28.0	—	2.3	—	—
25 Elementary	3,838	57.1	0.25	3.3	—	—
88 Village....	4,070	80.0	—	10.7	—	—
3 Girls	569	37.6	—	—	—	—

PROVINCE AND DISTRICT.	No. Exam.	% Trachoma	% Bilharzia	% Spleen	% Pulm. T.B.	% Ancylost.
Kordofan :—						
1 Intermediate	91	9.8	3.2	23.0	—	—
22 Elementary	2,575	16.4	18.6	35.6	—	—
11 Village....	640	16.5	10.9	48.4	—	—
Northern Province :—						
WADI HALFA DISTRICT.						
1 Intermediate	118	15.2	34.7	—	—	5.0
9 Elementary	1,255	39.0	13.0	0.8	—	1.1
50 Village	1,702	53.0	11.7	2.6	—	1.0
DONGOLA DISTRICT.						
5 Elementary	584	30.8	4.1	7.0	—	—
24 Village	969	64.1	8.3	26.2	—	—
BERBER DISTRICT.						
2 Intermediate	133	46.6	3.0	13.5	—	0.7
1 Technical	91	32.9	1.0	6.5	—	—
15 Elementary	2,142	46.3	5.8	5.0	—	0.2
70 Village	3,082	39.2	3.4	11.8	—	0.06
Upper Nile :—						
1 Elementary	104	6.7	0.9	18.2	—	1.9
4 Mission	162	0.6	—	41.3	—	—

QUARANTINE.

PORT SUDAN QUARANTINE.

Quarantine restrictions on account of smallpox were enforced against Calcutta in January and against Madras in February. These restrictions continued in force at the end of the year.

	1934	1935	1936	1937	1938	1939
Ships arriving	886	1,181	1,148	1,174	1,153	921
Sailing Vessels	509	435	427	599	539	506

764

It will be noted that the number of ships entering Port Sudan Harbour was 232 less than in 1938.

The harbour for native sailing craft which was established at Flamingo Bay during the year worked very satisfactorily. A small dispensary has been erected there and the crews of sailing craft are inspected for infectious disease on arrival.

Four ships were temporarily quarantined on account of smallpox and five cases of chickenpox were landed from ships.

142 ships entered the Port under radio-pratique.

The system worked well until terminated by the outbreak of war in September.

The health of the Port and Town was good. With the exception of a few cases of enteric fever, diphtheria and chickenpox there were no outbreaks of infectious diseases.

SUAKIN PILGRIM QUARANTINE.

The pilgrimage was smaller than last year. There were 5,523 outgoing pilgrims as compared with 8,159 in 1938. The relative numbers of Sudanese and West Africans remained approximately the same; 22.7% of the pilgrims being Sudanese in both 1938 and 1939.

Comparative figures for the last five years are as follows:—

Outgoing Pilgrims.

YEARS.	1935	1936	1937	1938	1939
Sudanese	931	1,315	1,728	1,851	1,255
West-Africans	741	2,089	4,618	6,308	4,268
TOTAL	1,672	3,404	6,346	8,159	5,523

All pilgrims were vaccinated against smallpox and inoculated against cholera before departure from Suakin. Those requiring it were also deloused.

Both the smallpox lymph and cholera vaccine was prepared in the Stack Laboratories, Khartoum.

The procedure in regard to returning pilgrims was, with slight modification, similar to that instituted last year.

In 1938 the admission of pilgrims was greatly facilitated by the construction of new waiting, medical examination and administrative sheds. This year their admission has been still further speeded up by improving the facilities for the transferring of baggage. As a result it is now possible under favourable circumstances to complete the admission of 600-700 pilgrims in approximately 4 hours.

In the absence of infectious disease it was found possible to retain the reduced quarantine period of 24 hours.

The accommodation both 1st Class and 3rd Class was increased during the year and further alterations were made in the general improvement of amenities.

The health of returning pilgrims was good. The only disease of note was chickenpox of which there have been to date some 15 cases. Many of the pilgrims on the earlier ships had coughs and colds probably the result of exposure to wet weather in the Hedjaz. Apart from chickenpox 10 cases were admitted to hospital.

WADI HALFA QUARANTINE.

297 Egyptian labourers passed through the quarantine. 24 were treated for bilharziasis either at Wadi Halfa or their destination. None were repatriated as unfit.

OPHTHALMIC REPORT.

By Mr. A. R. McKelvie.

58 male beds and 30 female beds are provided for this Department in the River Hospital, Khartoum.

The following figures summarise the work carried out during the year.

	River Hospital.		Omd. Hospital		Total.	
	1938	1939	1938	1939	1938	1939
Inpatients	615	693	125	146	740	839
Outpatients :						
Total Attendances	36,781	44,230	39,295	29,811	76,076	74,041
New Cases	6,019	8,765	6,336	8,511	12,355	17,276
Operations :						
Major	476	549	84	125	560	674
Minor	316	292	9	10	325	302
TOTAL	792	841	93	135	885	976

TRACHOMA.

The treatment of selected trachoma cases with sulphanilamide by mouth is still being carried out but no definite conclusion has been arrived at as to the suspected virus of trachoma being susceptible to chemotherapy.

The drug being used is M & B 693 (Sulphapyridine) and it proves very efficient in ophthalmias complicating trachoma and certainly in all acute and purulent conjunctivites.

As the majority of the cases are treated in the out-patients' Department treatment by mouth is unsatisfactory and expensive as attendance is very irregular. In consequence local treatment has been tried in the form of an ointment of M & B 693 1% in a water soluble base Eucerinum (Beiersdorf), combined with Silver Nitrate 1% drops and atropine 1% drops in the very severe cases. It has proved very satisfactory and the length of treatment in acute cases has been reduced.

Best results are still obtained in pannus and active keratitic cases while the lid manifestations show a lag in clearing though the immediate results are a definite lessening of the congestion and clearing of the conjunctiva.

In collaboration with the Lee Stack Laboratories an investigation was carried out in an attempt to assess the significance of the Weil-Felix reaction in trachoma and report of this work has been published (Kirk, McKelvie and Drysdale, *Journal of Hygiene* Vol. 39 No. 5 p. 553).

EYE OPERATIONS PERFORMED IN

MONTHS	CATARACT		GLAUCOMA						IRIDECTOMY OPTICAL	ENUCLEATION	PTERYGIA
	Extraction	Needling	Sclerectomy	Trephine	Cyclodialysis	Filtrating Iridectomy	Iridenclesis	Hyphama			
January	10	2	—	2	—	2	1	—	1	—	1
February	19	4	—	7	—	—	—	1	6	1	4
March	24	2	—	4	—	2	—	—	5	1	2
April	18	2	1	3	—	4	—	—	5	2	5
May	16	3	—	1	3	2	—	1	6	—	3
June	12	3	—	1	—	3	—	—	10	—	7
July	24	2	—	2	—	7	—	—	10	3	4
August	18	—	—	4	—	2	—	—	5	2	10
September	4	—	—	—	1	1	—	—	—	—	2
October	8	7	—	2	—	—	—	—	3	—	2
November	10	1	—	—	—	—	—	—	3	—	2
December	10	2	—	1	—	3	—	—	5	—	4
TOTAL	173	28	1	27	4	26	1	2	59	9	46

INPATIENTS TREATED IN THE RIVER

MONTHS.	EYE LIDS					CONJUNCTIVITIS					LACHRYMAL APPARATUS	CORNEA			IRITIS AND CILIARY BODIES	
	Injury to the lid skin.	Blepharitis.	Chalazion	Trichiasis	Tumour of the lid	Conjunctivitis	Trachoma	Phlyctenular	Foreign Bodies	Pterygium	Dacryocystitis	Ulceration	Keratitis	Leucoma	Iridocyclitis and Iritis	Prolapse
January	—	1	1	—	–	20	2	–	–	–	—	1	1	4	1	1
February	1	1	2	—	–	14	4	2	–	2	2	6	2	7	2	1
March	—	1	–	2	–	18	8	–	–	1	1	5	–	9	1	–
April	—	3	1	9	–	17	6	–	1	–	—	3	–	4	2	–
May	2	2	–	5	1	30	2	–	1	1	—	–	2	8	1	–
June	—	1	–	3	–	14	6	–	–	1	—	1	2	4	3	–
July	—	2	–	4	–	11	–	1	1	–	—	1	–	4	—	2
August	—	1	–	—	–	14	1	–	–	–	—	1	2	2	2	–
September	—	—	–	3	–	11	3	–	–	–	—	2	–	2	—	–
October	—	—	–	6	–	24	2	–	–	–	—	–	–	3	1	–
November	—	1	–	7	–	14	2	–	–	–	1	1	2	2	1	–
December	—	1	–	4	–	17	7	–	–	1	—	5	2	3	2	–
TOTAL	3	14	4	43	1	204	43	3	3	6	4	26	13	52	16	4

THE RIVER HOSPITAL DURING 1939.

Staphyloma	Trichiasis	Tarsectomy	Cautery	Tattoo	Paracentesis	Foreign Body in Orbit	Retrobulbar Abscess	Tumour		Dacryocystitis	Lachrymal Cyst.	Plastic Operations	Minor Operations	Total
								Innocent	Malignant					
—	—	12	1	3	—	—	—	1	4	2	1	2	27	72
1	5	—	—	2	—	—	—	—	—	—	—	2	36	88
—	4	—	—	—	—	—	—	—	—	—	—	1	18	63
1	5	—	—	—	—	—	1	—	1	—	—	2	14	64
—	10	1	1	4	1	—	—	2	1	—	—	4	38	97
—	11	—	—	—	—	1	—	1	—	—	—	3	27	79
—	7	—	—	2	—	—	—	—	1	—	1	—	21	84
—	10	—	—	1	—	—	—	2	—	—	—	3	25	82
—	10	—	—	—	—	—	—	—	—	—	—	2	27	47
—	13	—	—	—	—	—	—	—	—	—	—	—	15	50
—	11	—	—	—	—	—	—	—	—	—	—	1	24	52
—	12	—	—	1	1	—	—	1	1	—	—	1	20	63
3	98	13	2	13	2	1	1	7	8	2	2	21	292	841

HOSPITAL EYE DEPARTMENT 1939.

Retina		Optic Nerve		Lens and Vitreous					Eye-Ball		Orbit		Defective Vision					Remarks.
Retinitis	Detachment	Neuritis.	Atrophy	Cataract Congenital	Cataract Senile	Dislocation	Opacity	Traumatic	Injury Panophthalmitis	Glaucoma	Cellulitis	Malignant	Hypermetropia	Myopia	Astigmatism	Sebaceous Cyst	Total	
–	–	–	–	—	12	1	–	–	1	4	–	2	–	1	–	1	54	
–	–	–	–	—	14	–	–	2	—	5	2	–	–	1	–	–	70	
–	1	–	–	—	12	–	–	3	—	3	–	–	–	–	–	–	65	
–	–	–	–	—	17	–	–	–	1	11	–	–	–	–	–	3	78	
–	–	–	–	—	16	–	–	2	1	4	–	–	–	2	–	–	80	
–	–	–	–	1	10	3	–	–	—	2	–	–	–	–	1	4	56	
1	–	–	–	—	10	–	–	–	—	8	–	–	4	–	–	–	49	
–	–	–	–	—	13	–	–	–	—	1	–	–	1	–	–	4	42	
–	1	–	–	—	11	–	–	1	—	2	–	–	1	–	–	1	38	
–	–	–	–	—	5	–	–	1	—	2	–	–	–	–	–	1	45	
1	–	–	1	—	9	1	1	1	1	4	–	–	–	–	–	–	50	
–	1	1	–	—	13	–	–	1	1	6	–	–	1	–	–	–	66	
2	3	1	1	1	142	5	1	11	5	52	2	2	7	4	1	14	693	

OUTPATIENTS TREATED IN THE RIVER

Months	Eye Lid					Conjunctivitis					Lachrymal	Cornea			Sclera	Iritis and Ciliary Body		Choroid	Retina		
	Injury to the Lid	Blepharitis	Hordeolon and Chalazion	Trichiasis	Tumour	Conjunctivitis and Trachoma	Trachoma	Phlyctenular	Foreign Body	Pterygium	Dacryocystitis	Keratitis	Ulceration	Leucoma	Scleritis Superficial and Deep	Iridocyclitis and Iritis	Prolapse	Choroiditis	Retinitis	Haemorrhage	Detachment
January	–	7	11	3	–	255	76	1	22	6	–	2	5	9	—	1	2	1	–	–	–
February	1	8	18	—	–	207	56	2	13	8	2	6	20	10	—	2	1	–	–	–	–
March	–	15	20	3	–	272	86	–	18	7	3	5	13	13	1	1	1	–	–	1	1
April	–	12	32	14	–	294	112	–	18	12	–	4	16	10	—	3	–	–	–	–	–
May	2	14	34	10	1	351	96	–	29	13	–	7	14	15	—	3	–	–	–	–	–
June	1	5	27	13	–	305	96	–	25	12	2	6	12	16	—	7	–	1	1	–	–
July	1	9	32	13	–	261	76	5	24	14	1	5	14	15	—	3	3	–	1	–	–
August	1	9	26	7	–	264	65	2	20	17	1	2	12	10	—	3	4	–	–	–	–
September	2	3	31	9	–	230	65	–	23	7	–	1	5	9	—	5	–	–	–	–	1
October	–	3	23	12	–	322	89	–	14	10	–	1	8	9	—	5	–	–	–	–	1
November	–	4	17	14	–	287	102	–	15	5	3	3	12	9	—	4	–	1	2	–	–
December	–	6	23	11	–	381	111	–	24	11	–	3	17	13	—	4	–	1	–	–	1
	8	95	294	109	1	3,429	1,030	10	245	122	12	45	148	138	1	41	11	4	4	1	4

BRITISH TROOPS STATISTICS.

Refraction	85
Squint	3
Corneal Nebulae	2
Rupture of Pupillary Margin	1
Post Synichiae	1
Corneal Ulcer	1
Acid Burn	1
Traumatic Cataract	1
Iritis	1
Diplopia and Esophoria	1
Rupture of Choroid	2
Choroiditis	2
Central Choroiditis	1
Optic Atrophy	1
Hole in Macula	1
Corneal Abrasion	1
Acute M. P. Conjunctivitis	1
Total	106

HOSPITAL EYE DEPARTMENT DURING 1939.

Optic Nerve		Amblyopic	Lens and Vitreous					Eye-Ball		Orbit				Squint	Various				
Neuritis	Atrophy	Amblyopia	Cataract Congenital	Cataract Senile	Traumatic	Dislocation	Opacity	Injury Panophthalmitis	Glaucoma	Cellulitis	Malignant Tumour	Innocent Tumour	Refraction	Strabismus	Staphyloma	Sebaceous Cyst.	Vision Test for Medical Exam.	Total New Cases.	Total Attendances.
–	–	–	—	27	5	1	–	1	7	–	2	1	85	–	1	1	201	733	3,278
–	–	–	—	31	3	–	–	—	8	2	–	–	82	–	–	–	188	668	3,136
–	–	–	—	37	4	–	–	—	8	–	1	–	101	–	2	–	160	773	3,345
–	1	–	—	52	–	–	–	1	16	–	1	1	108	–	5	–	151	866	3,380
–	–	–	—	41	2	–	–	1	13	–	–	–	114	–	2	3	125	887	3,132
–	–	1	2	46	2	3	–	—	12	–	1	–	99	–	4	–	123	826	2,904
–	–	–	—	37	–	–	–	—	15	–	–	–	106	–	2	4	148	785	3,062
–	–	–	—	26	–	–	–	—	5	–	–	1	86	1	4	–	58	628	2,677
–	–	–	—	40	5	–	–	1	6	–	–	–	93	–	6	4	59	602	1,302
–	–	–	—	28	3	–	–	1	5	–	–	–	75	–	7	1	232	849	2,814
–	1	–	—	29	3	1	1	2	8	–	–	–	89	–	4	1	145	761	2,344
1	–	–	1	32	4	–	–	1	15	–	1	–	91	–	3	–	152	907	3,465
1	2	1	3	426	31	5	1	8	118	2	6	3	1,129	1	40	14	1,742	9,285	34,839
BRITISH TROOPS IN THE SUDAN																		106	9,391
Grand Total ...																			44,230

REPORT ON THE STACK MEDICAL RESEARCH LABORATORIES FOR THE YEAR 1939.

By Dr. E. S. Horgan.

RESEARCH.

Apart from the continued malarial survey in the Gezira by Mr. Lewis, a summary of which will be found in the entomological section, the principal subject of research has been Kala Azar in the Fung. This has been carried on uninterruptedly throughout the year by Dr. Kirk and Mr. Lewis, and a brief summary of their investigations will be found under the appropriate heading.

Research has also been carried out by the writer and Dr. Mansour Ali Haseeb on various immunological problems of variola and vaccinia viruses.

ROUTINE AND EDUCATIONAL ACTIVITIES.

A summary of the routine work is shown at the end of the report. The total 24,540 represents an increase of approximately 2,000 specimens over the 1938 figure, and the increase has been chiefly accounted for by a larger number of Kahn Tests and Widal Reactions.

Following the policy of decentralization commenced at Port Sudan, several other hospital laboratories, Fasher, Medani, Atbara, Juba, have been equipped, during 1939, with the necessary apparatus and reagents for the Kahn Test and selected Sudanese Laboratory Assistants were given special training in the performance of this test. The standard of accuracy obtained under expert supervision has been high but whether it will remain so when they are left on their own responsibility remains to be seen.

The positive isolations for bacillary dysentery and typhoid fever were much fewer than 1938, probably owing to the very light rains in Khartoum during the summer.

Owing to the outbreak of war a great deal of extra work in blood typing of volunteers, and preparation of blood transfusion apparatus has been thrown on the laboratory staff, but as such work can hardly be considered either routine or research, the figures are not included in this report.

HOSPITAL LABORATORIES.

There has been no increase in the number, as with one or two exceptions all hospitals are now furnished with laboratory facilities. The total cadre of Sudanese Laboratory Assistants is 32 and their training and refresher courses remain unchanged. Concerning their efficiency I have nothing further to add to my remarks in the 1938 report.

LABORATORY REORGANISATION.

During the year the Medical Entomologist, previously seconded, and the Chemical Analytical Section (Wellcome Research Laboratories) were transferred from the Agricultural Research Service to the Medical Service. A brief summary of the Government Analyst's report will be found at the end of this report.

ROUTINE EXAMINATIONS.

Pathological Specimens.

The total was 592 which represents a considerable increase over 1938 (476).

Post-Mortem Examinations.

27 were carried out in Khartoum Civil Hospital including 9 medico-legal requested by the police authorities.

It is interesting to note that a case of heat stroke occurred during the middle of the hot weather, for in spite of the high summer temperatures, this condition is very rare in Khartoum. The patient, a middle aged British official of a large Company, died suddenly after a short illness and it was possible to carry out a few hours after death a full post mortem including histological examinations. The chief findings were the extraordinary fluidity of the blood which was almost black, marked oedema of the lungs with deeply congested bases, congestion of the right side of the heart, and slight congestion of the brain. The mucous membrane of the stomach was also congested. The spleen, kidneys and suprarenals apart from slight congestion were normal. Sections showed congestion and oedema in the lungs, cloudy swelling in other organs, and a marked fatty degeneration in the liver.

NEOPLASMS.

178 were received of which 48 were benign.

SITE.	Carcinoma	Sarcoma.	Endothelioma	Perithelioma	Melanoma.
Breast	20	—	—	—	—
Bladder	2	—	—	—	—
Prostate	1	—	1	—	—
Lip and Mouth	2	—	1	—	—
Liver	3	—	—	—	—
Anus	3	1	—	—	—
Eye and Orbit	10	—	—	—	—
Maxilla	—	2	2	—	—
Face	4	—	—	—	1
Neck	2	1	—	1	—
Leg	5	4	2	—	2
Foot	—	1	—	—	15
Arm and Hand	1	3	1	—	—
Bone	—	1	—	—	—
Glands (Lymphatic)	2	2	1	—	—
Gland Thyroid	1	—	—	—	—
Abdomen	3	1	—	—	—
Female external genitals	4	1	—	—	—
Uterus	7	2	—	—	—
Ovary	1	—	—	—	—
Buttock	2	—	1	—	—
Scalp	1	1	—	—	—
Chest	1	1	—	—	—
Scrotum	—	1	—	—	—
Axilla	—	—	—	—	1
Parotid Region	—	1	—	—	—
Thigh	—	—	1	—	—
Peritoneum (secondary to Ovary)	1	1	—	—	—
TOTAL	76	24	10	1	19
					Total 130

Comments. The chief point of interest again, is the large number of Melanomata (19) the majority of which are from the foot, usually in the region of the ball of the great toe. The neoplasm under the heading "axilla" commenced in the region of the elbow joint and then had a structure rather like a solid carcinoma or endothelioma. After removal, recurrence rapidly took place with invasion of the lower end of the humerus, and the arm was amputated from the shoulder. The histological and radiological appearances were still consistent with the diagnosis of endothelioma of bone. At a later date recurrence took place in the axilla and this time the neoplasm had the appearance of a typical Melanoma.

Of the rare neoplasms the perithelioma was a typical specimen arising from the carotid body.

Liver. The 3 carcinomata were primary.

Anus and Bladder. There is some reason to believe that the epitheliomata in these situations are related to a chronic bilharzial infection. One interesting specimen (not recorded in the above list) was a recurrent polypus from the urethra of a Sudanese woman. It contained numbers of degenerated bilharzial eggs undergoing phagocytosis and the epithelium was highly irregular presenting pre-cancerous appearances although no definite area of malignancy could be found.

RABIES.

ROUTINE EXAMINATIONS—161 brains were received of which 6 arrived in a decomposed state and useless for examination.

49 were positive for Negri bodies, the distribution being 36 dogs, 1 cat, 8 donkeys, 2 camels, 1 goat and 1 mule.

No human brains were received for examination.

Rabies Vaccine. 51,060 c.cms. were issued — the method of preparation remained unchanged.

JAUNDICE OF OBSCURE ETIOLOGY.

(See also Reports for 1936 and 1938).

Livers from five cases were received during the year three of which were viscerotome specimens. In two cases it was possible to make a fuller examination, the results of which are summarized.

The first case, from Juba, showed an extensive acute necrosis with scattered fatty degeneration of the liver cells and an almost complete loss of structure of the lobule. Small foci of lymphocytes were sparsely scattered throughout the liver, but otherwise signs of acute inflammation were absent. The kidneys generally showed cloudy swelling but in some places there was an acute necrosis of the convoluted tubules, their lumina being filled with debris. The spleen showed no changes of note. The second case came from Omdurman Hospital and through the kindness of Dr. Macdonald it has been possible to get clinical details. The patient—a Sudanese aged 22—was admitted with history of about three days fever and died of sudden collapse four days later. Jaundice increased progressively and was deep at the time of death. The temperature ranged between 104° F. at night accompaned by rigors, and 99° F. in the mornings. Blood count showed leucopenia—the leucocyte count being 4,000—but no other abnormal changes. Examination for parasites negative. The spleen and liver were tender and enlarged (about 3 fingers). At post mortem the spleen and liver were large and soft ; the other organs appeared normal.

Owing to the mistake of a native driver the organs were received 24 hours later and as the weather was hot they had undergone considerable putrefactive changes but it was possible to obtain sections of the liver. These showed a curious patchy necrosis ranging from some areas of a roughly mid zone distribution to others in which destruction of the polygonal cells was complete. Fatty degeneration was scattered throughout but was not of marked degree. There was sparse infiltration of plasma cells and lymphocytes but no other signs of inflammation. Two other livers (viscerotome) showed such complete necrosis that it was difficult to identify the organ. In neither was there any inflammatory reaction apart from scattered lymphocytes.

It is curious that in spite of intense jaundice none of these livers shows evidence of bile stasis.

The clinical course of these fatal cases of jaundice appears to be short and, although estimates before admission to hospital must be accepted with caution, in most cases the illness appears to last between 5 and 8 days. There is some evidence to suggest, that if not fatal within this period, the chances of recovery are good.

Practically nothing is known about the regenerative changes in patients who recover, but one specimen examined this year may throw some light on the matter ; unfortunately no clinical details were supplied in this case.

The liver showed the usual areas of acute necrosis but in other areas there was evidence of a marked and rapid regeneration of the polygonal cells. There was a marked infiltration of lymphocytes and large mononuclears in Glisson's capsule and the appearance was that of an early multilobular cirrhosis. This condition is not uncommon in the Sudan and although some of the cases may be of bilharzial origin, in others there is no such history and it is possible that they represent later stages of this obscure jaundice syndrome.

RABIES.

RESEARCH WORK.

Negri Bodies in Fixed Virus.

In continuation of the work mentioned in the 1938 report, a further series of hippocampi from the sheeps' brains used for routine preparation of vaccine was examined. In twelve serial passages a careful examination revealed in all, the presence of Negri bodies although in most brains they were small and very scanty. Some of the larger ones appeared typical although many of them appeared completely homogeneous and " Innenkorper " could not be demonstrated with Lépine's or Leishman's stains. There appeared to be no relation between the size and number of the Negri bodies and the particular serial passage for in several cases a brain showing small and scanty bodies produced in the next sheep larger and more typical bodies in greater numbers.

A comparable series of rabbits brains failed to reveal, except in a couple of doubtful cases, any Negri bodies but a constant and striking feature was the degree of destruction of the large ganglion cells of the hippocampus. In brains removed from animals moribund on the 6th and 7th days this destruction was almost complete, the cells appearing for the most part as shrunken pyknotic masses although some appeared to have undergone chromatolysis. Brains examined at varying intervals after inoculation showed that these degenerative changes commenced about the 3rd day. The above results considered as a whole would suggest that a close but inverse relationship exists between the degree of necrosis of the ganglion cells and the presence of Negri bodies and they are in close accord with the results of various workers especially Nicolau and Kopciowska (*Ann. Inst. Pasteur* 1934 Vol. 53 p. 418). In this paper dealing with the nature of Negri bodies the authors consider them as essentially a defence mechanism of the cell and the present series would suggest that different animal species, as the rabbit and sheep, vary considerably in this respect. The view that they are colonies of virus (Topley and Wilson. Text Book of Bacteriology 1936—2nd edition) is not borne out by the present work, for it is difficult to see why they should be present in varying numbers in one animal species but absent in another, although in both, the behaviour of the virus is absolutely typical, with an incubation period of 6 to 7 days. Further, a few experiments on the potency (end point) of sheep and rabbit fixed viruses failed to reveal any significant difference.

Infectivity of Fixed Virus by Subcutaneous and Intramuscular Routes.

A few experiments have been carried out on different animal species. Emulsions (5%) of sheep fixed virus were inoculated in doses of 1.0 c.cms. for rabbits and 0.5 c.cm. for rats and mice, the sites being the subcutaneous tissues of the groin or the muscles of thigh.

ROUTE OF INOCULATION.	ANIMAL.							
	Guinea Pig		Rat		Mouse		Rabbit	
	+	—	+	—	+	—	+	—
Subcutaneous	Not done		3	3	2	2	1	1
Intramuscular	2	2	4	2	1	3	3	1

The incubation periods in days were as follows :—

	Guinea Pig	Rat	Mouse	Rabbit
Subcutaneous	Not done	9, 9, 10	12, 14	14
Intramuscular	12, 18,	8, 9, 11, 12	16	8, 8, 15

The results are fully tabulated as they are of considerable interest, showing that although the virus is absolutely fixed as regards the regularity of its incubation period following sub-dural inoculation, in other respects it behaves rather as a street virus. Thus, it is capable of infecting with comparative regularity by the subcutaneous route, its behaviour being closely analagous to that of the Sassari strain of fixed virus. The latter strain has been quoted as unique in this respect (Lépine and Sautter—*Cmpt. Rend. Soc. Biol.*—1936 Vol. 122—p. 542). The Khartoum strain however differs considerably from the Sassari in its lack of Negrigenesis in the rabbit. Finally it must be borne in mind that both of these strains are derived from the original Paris fixed virus.

KALA AZAR.

With the exception of the serological investigations, which have been discontinued for the present, work has been carried on under the main headings indicated in last year's report. The preliminary sandfly survey has been completed and a detailed account of the results is at present in press. The distribution of thirteen species or varieties has been recorded and it has been shown that at least six of these can bite man. It is interesting to note, that four of these six belong to the sub-genus *Prophlebotomus* Parrot, members of which were believed until recently to bite only cold blooded animals.

Infection of the skin has now been demonstrated in quite a high proportion of cases of kala azar, suggesting that it is probably from this tissue that the vectors may take up the parasites, rather than from the blood.

GLAND PUNCTURE IN KALA AZAR.

The frequent occurrence of parasites in the skin, but not in the blood, suggests that the lymphatics may play an important part in the spread of infection through the body. It has been found that diagnosis can be confirmed in a high proportion of cases by finding parasites in the "juice" obtained by gland puncture. An account of the method and preliminary results has been published elsewhere (*Trans. R. Soc. Trop. Med. Hyg.* in press), but as the technique used is exceedingly simple and may obviate the necessity for routine diagnostic spleen puncture in a large proportion of cases, it may with advantage be described briefly.

The glands to be punctured are the lower group of the superficial inguinal lymph glands (Gray's Anatomy, 1938), which are disposed vertically along the terminal part of the long saphenous vein. They can usually be readily palpated if a deep grip is taken with the thumb and forefinger. The skin having been sterilised, the glands are identified, pulled up from the underlying tissues and steadied above the thumb and forefinger of the operator's left hand. A dry, sterile hypodermic needle (No. 16 is convenient size) is pushed through the skin and into the gland by the right hand of the operator. No syringe is attached to the needle, as once the gland has been penetrated the juice runs up into the needle of its own accord. It is usually easy to feel when the needle has entered the gland. Once the needle has entered the gland, it is held there for a second or two, then quickly withdrawn, and attached to a small syringe, by means of which the "juice" in the needle can be blown out on to a slide and a smear made and stained in the usual way for examination. With practice, the operation can be carried out very rapidly, and the amount of danger or discomfort to which the patient is subject, is negligible.

CHEMOTHERAPY.

It has been recognised that a more effective specific is urgently needed in the Sudan, where the results of treatment of kala azar with antimony preparations compare unfavourably with those reported from other countries. In collaboration with Professor Warrington Yorke, work has been undertaken during the latter part of 1939 to test the effectiveness of a series of very actively trypanocidal substances which have been produced by the Liverpool School of Tropical Medicine. The preliminary results with one of these (at present designated M. & B. 744) are encouraging, but it is too early yet to assess its final effectiveness.

DIPHTHERIA.

15 strains of *C. diphtheriae* isolated in Khartoum were typed. 3 were *Intermediate* and the remainder *Mitis*. The preponderance of the latter is in conformity with previous results.

LOBAR PNEUMONIA.

Of 15 strains of *Strep. pneumoniae* isolated from patients in Khartoum Civil Hospital—2 were Type I, 1 Type II and 12 were Group IV. Individual typing sera for the latter were not available. This work has been discontinued, as with the advent of Sulphonamide therapy a favourable response seems to be largely independent of the particular infecting type of pneumococcus.

TYPHOID FEVER.

Vi Agglutination in the Detection of Carriers.

In view of the claims of Felix, Bhatnagar, and others, that a close relation exists between the carrier condition and the presence of Vi agglutinins in the serum, this problem has been under investigation during the year.

Vi strains of *B. typhosum*, (Ty 2 and Vi I) and specimens of pure Vi sera were kindly provided by Dr. Felix and were used to prepare standard suspensions and rabbit sera following the exact technique of Felix (*Jl. of Hygiene* 1938 Vol. 38 p. 750).

The faeces and urines were plated out on Wilson and Blair's Medium which has given in the Sudan incontestably superior results over McConkey's Medium for the isolation of *B. typhosum* from faeces.

Results are as follows :—

Vi agglutinins and Faeces and Urines (F & U).		Convalescents.	Contacts (Carriers ?)
Vi F & U	+ +	1	1
Vi F & U	+ —	17	6
Vi F & U	— +	0	1*
Vi F & U	— —	67	157

Vi+ signifies agglutination titres of 1 in 25 or over. The faeces and urines were examined on five consecutive occasions at about five days intervals before a final result of negative was accepted.

*This case was a healthy carrier (faecal), a milk vendor by occupation, discovered during the investigation of a typhoid outbreak in Shendi during the summer. When examined four months later, the Vi agglutination was still negative, while *B. typhosum* was again readily isolated from the faeces.

The figures are comparatively small, but as far as they go, they definitely fail to confirm that this method is likely to be of diagnostic value in the Sudan and as evidenced by the above case it may even prove misleading. No explanation can be given of the discrepancy between these results and the satisfactory findings of the above workers.

BACILLARY DYSENTERY.

Mannite fermenting organisms—of 37 strains isolated, 5 were Sonne the remainder belonging to the Flexner group. The latter were typed according to the recent classification of Boyd 1938 (*Jl. of Hygiene* Vol. 38—p. 477). The serum was prepared in rabbits from an old Hiss-Russell strain which according to Boyd possesses only group antigen.

30 strains fell into the V-Z group and the two inagglutinable ones appeared to be identical with the type D 1 of Boyd.

Both the patients (British) infected with the latter had mild but typical attacks of clinical dysentery.

SYPHILIS.

Of the 14,965 Kahn Reactions 35% were positive. The exact significance of this result is doubtful and it should not be taken as an index of the incidence of the disease among patients attending hospitals and dispensaries. The incidence as a whole is much lower, but on the other hand it is well known that in parts of Western Kordofan and Darfur; syphilis (clinical) is present in a high proportion of the population but owing to difficulties of distance and transport, few sera are received from these areas. Further, many typical cases of syphilis are treated without a preliminary Kahn. The majority of the sera received come from the Northern and Central Sudan and are sent either to confirm a diagnosis in suspicious cases, or to exclude it in the routine examination of undiagnosed cases.

An index of the incidence of syphilis among the population of the Northern and Central Sudan as a whole can be obtained from the figures of the Central Prison, Khartoum North where routine Kahn tests are carried out on all admissions, and from the figures of pregnant women attending the Women's Hospital, Omdurman (See S.M.S. Report 1937 p. 42) in whom Kahn tests are routine.

Both these classes approximately represent a random selection of the population and the percentages are 14% and 10% respectively.

VACCINIA.

Vaccine Lymph. During the year 39 calves were used. The total yield was 1,529 gms. the average being 40 gms. per calf, and the maximum 63 gms. 984,000 doses were issued mostly for routine vaccination campaigns as there was no severe outbreak of smallpox during the year.

Research. Two problems were under review.

(a) Cross immunity in monkeys between the viruses of Variola, Alastrim and Vaccinia.

The results have been published in full. (Horgan and Mansour Ali Haseeb—*Jl. of Hygiene* 1939—Vol. 39 p. 615).

(b) Relation of dosage to the degree of immunity produced by vaccination.

This important aspect of vaccination seems hardly to have received the attention it merits and few references on the subject appear in the literature, although Clearkin of Tanganyika some years ago, carried out a series of important observations. There are essentially two aspects of the subject often confused, stated as follows :—

(i) *Quantitative.*

Is there a direct relation between the degree of immunity and the actual number of effective units (Elementary Bodies) introduced into the animal ; a necessary corollary of this would be the smallest dose of vaccinia capable of affording complete which may be protection?

(ii) *Qualitative.*

Are there qualitative differences in immunizing power between strains of vaccinia virus from different sources *e.g.*, a variola-vaccinia compared to a cow-pox vaccinia? Also, does tissue adaptation—a mesodermatropic (" neuro-vaccinia ") as compared with an epidermatropic strain—affect the result? It is well known that the " neuro-vaccinia " (mesodermatropic) variant is more likely to produce generalized and often fatal infections in rabbits than is the ordinary strain passaged on the skin. Is this " virulence " correlated with a higher immunogenic capacity?

Several series of experiments have been carried out using different strains of virus and different routes on animals (monkeys and rabbits).

The results can be summarized as follows :—

(1) In both the rabbit and monkey, very small doses of vaccinia virus, introduced either by scarification or intradermal routes can give rise to very strong or complete immunity.

(2) This quantity of virus is generally between 10 and 100 minimal infecting doses. (M.I.D.)

(3) The subcutaneous route was much less effective in rabbits (monkeys were not used), even large doses of 2,000 M.I.D., producing little evidence of immunity one month after inoculation.

(4) No differences in protective value could be detected between two different strains of variola-vaccinia (epidermatropic)

(5) A mesodermatropic strain (neuro-vaccinia) produced much more violent reactions in rabbits and monkeys especially in the latter, when inoculated intradermally. In spite of this no differences in immunity could be detected.

(6) Both the intradermal and cutaneous routes appeared equally effective in inducing immunity.

(7) In the intra-dermal method vesicle formation was unnecessary for the production of immunity.

The findings are in close accord with the recently published results of McClean and Henderson (*Jl. of Hyg.* 1939—Vol. 39—p. 680). These workers lay stress on the ease with which immunity can be induced in rabbits by small doses of virus inoculated intra-dermally, and specially on the fact that vesicle formation is unnecessary, in respect of which the rabbit differs profoundly from man.

BIOCHEMICAL.

The total 193 is almost double the 1938 figures (104). A considerable number were Glucose Tolerance Tests in cases of lowered carbohydrate tolerance suspected of being diabetics; an increasing number of Fractional Gastric Analysis, Blood Ureas and chemical analysis of cerebro-spinal fluids was also carried out.

SUMMARY OF ROUTINE EXAMINATIONS.

Blood Kahn Tests	14,965
Blood Widal Reactions	1,984
Blood Cultures	575
Blood Films	1,137
Blood Counts (Total)	15
Cerebrospinal Fluids	133
Biochemical Tests	193
Autogenous Vaccines	7
Pathological Histology (including brains for Rabies)	592
Faeces	1,662
Urine	1,087
Throat Swabs :—	
C. diphtheriae positive	126
,, negative	1,553
Virulence Test	4
Sputa :—	
T. B. positive	4
T. B. negative	60
Spleen Smears.	
(Kala azar parasites)	7
General Bacteriological Examinations	248
Water Examinations	188

Summary of Faeces Tests.

Bact. flexneri isolated	26
,, *shigae* ,,	6
,, *ambiguum* ,,	5
,, *Sonne* ,,	4
B. typhosum ,,	104
B. paratyphosum A,,	1
Amoeba present ,,	11
Ova present	46
Negative	1,459

Summary of Urine Tests.

B. typhosum isolated	51
Ova present	1
Negative	1,035

Summary of Blood Films for Parasites.

Malaria :—

Benign Tertian	40	Relapsing Fever	52
Subtertian	262		
Quartan	14	Negative	769

Summary of Widal Reactions.

B. typhosum	231	*Br. Melitensis*	40
B. paratyphosum A	2		
B. paratyphosum B	1	Negative	1,710

Summary of Blood Cultures.

B. typhosum isolated	100	Other organisms isolated	9
B. paratyphosum B ,,	1		
Strep. pyogenes	5	Negative	460

Total Examinations for 1939=24,540.

Vaccines issued during the year.

Cholera	7,750	c.cms.
Gonococcus	2,000	,,
Anti-Rabic	51,060	,,
T.A.B.	7,300	,,
Staph. Aureus	1,300	,,
Vaccine Lymph	984,000	doses.

REPORT ON MEDICAL ENTOMOLOGY FOR 1939.

(By Mr. D. J. Lewis).

SANDFLIES.

GENERAL SURVEY.

In connection with Dr. Kirk's work on kala-azar he and Mr. Lewis have continued the survey of the distribution of *Phlebotomus* in the Sudan and particular observations on certain species.

The results hitherto obtained by the general survey, together with previous knowledge of sandflies in the Sudan, have been summarised in a paper prepared for publication. Some 1,400 specimens have been examined. One of the species, *Phlebotomus clydei* Sinton, has been found in parts of India but had not been recorded previously from Africa. A paper was published (*Proc. R., Ent. Soc. Lond.* B, 1939, vol. 8 p. 155) describing slight differences between the Indian and Sudan forms.

Several species which were known only from a few places are now found to have a much wider distribution. *Phlebotomus papatasii* has recently been found near Malakal, about 200 miles further south than places where it was formerly known. *Phlebotomus clydei,* at first found in Kassala and Gezira Provinces, has now been obtained at El Fasher.

Various methods of collecting have been tested, the most useful being by a suction catcher ; several species of sandflies however, show marked diurnal periodicity, only appearing at certain times and for some of these traps have to be set. Those found most useful are various forms of paper traps made sticky by simsim oil, and sandfly nets erected over soil cracks.

The following list shows the species of sandflies at present known in the Sudan and those which can bite man.

Species or variety	Species which can bite man
Phlebotomus papatasii Scop.	X
,, *langeroni* var. *orientalis* Parrot	X
Phlebotomus minutus var. *signatipennis* Newst.	
Phlebotomus africanus Newst.	X
,, ,, var. *sudanicus* Theo.	
Phlebotomus schwetzi Adl., Theo. and Parr.	X
,, ,, var. *aethiopicus* Parr.	
Phlebotomus congolensis Beq. & Walr.	X
,, ,, var. *distinctus* Theo.	
Phlebotomus squamipleuris Newst.	
,, *affinis* Theo.	
,, *adleri* Theo.	
,, *clydei* Sinton	X

Species which bite man.

Of the six species which can bite man *P. africanus* has recently been definitely recorded as biting for the first time (at Singa). It evidently does so very rarely. *P. clydei* also was recently found for the first time to bite man, but this species bit in considerable numbers out of doors in certain places and was in fact the only biter present.

Experiments are being continued on the feeding habits and other bionomics of man-biting species.

MOSQUITOES IN RELATION TO MALARIA.

General.

Anopheles wellcomei Theo. has proved to be common in many parts of the Upper Nile Province and parts of the Jebel Aulia reservoir. Hitherto the scope of mosquito surveys in these areas has been limited because the early stages of this species were unknown. These have now been obtained and a paper was published (*Ann. Trop. Med. and Parasit.* in press) in which the eggs, larvae, pupae and males were described. It was found that the larvae can easily be recognised in the field owing to their peculiar habit of climbing up water plants.

The Gezira.

Observations on mosquito-eating fish have been continued. *Gambusia affinis.* breeds readily in pools under the climatic conditions of the Gezira. In a controlled experiment it was effective in keeping pools of from 6 to 80 square metres free from mosquito larvae.

At the Agricultural Research Institute the use of Paris green for controlling anopheline breeding has proved much more effective than the use of oil and has resulted in a saving of over 80 per cent. of the original cost of insecticide. Part of this saving is being spent on the spraying of houses which is proving effective. Although culicine larvae are not affected by Paris green the local species are not causing any trouble. *Aedes aegypti* is of course still controlled.

Khartoum.

The survey of Anopheles mosquitoes is being continued. *Anopheles gambiae* remains the commonest species but has been scarce this year.

Sennar.

Collections made on the Blue Nile between Sennar to Roseires show that the mosquito-eating fish *Haplochilus marni* and *H. schoelleri*, so common in the White Nile in the same latitude, are apparently absent.

As on the White Nile, *Anopheles funestus*, although rare in the reservoir area, is found commonly a few miles south of it.

White Nile Reservoir.

An assistant has started a survey of mosquitoes with the object of observing the changes in the mosquito fauna consequent on the gradual rise of the reservoir level. A tour was made in September for the purpose of giving advice on mosquito control in pump schemes.

Upper Nile Province.

The mosquito fauna along the river in this area was found to be markedly different from that of the Jebel Aulia reservoir. In the Upper Nile *Anopheles funestus* is abundant about as far north as Renk, although in the reservoir area not a single specimen has yet been found. The possibility of a northward spread of this dangerous species can not be regarded as impossible.

Near Fashoda, the breeding places of *Anopheles wellcomei* Theo. were found for the first time.

MOSQUITOES AND YELLOW FEVER.

Aedes aegypti.

During the annual survey of this species by the Public Health Section 4,074 specimens of *Aedes aegypti* and 1,552 of other species of *Aedes* were received.

In the course of this survey large numbers of *Aedes aegypti* have been received from places on the Red Sea coast, many of these being the pale form referred to in the annual report last year. Living specimens from Port Sudan were supplied by the Public Health Inspector and a cage colony has been kept for four months. The pale colour persists, showing that it is inherited. This form is known from several coastal areas in British Somaliland and elsewhere.

Other species.

Aedes luteocephalus Newst. and *Taeniorhynchus africanus* Theo. have been found for the first time at Sennar. Both these species are known to be capable of transmitting yellow fever by biting.

Aedes metallicus is common in the Sudan but its possible relation to yellow fever is not known. It was bred in captivity this year with the object of sending living specimens to England for transmission experiments.

GENERAL.

Collections received.

The specimens received from many parts of the country provide useful additions to our knowledge of insects of medical importance. 10,615 specimens were examined during the year in addition to 6,149 which were identified in the course of surveys of mosquitoes and other insects now in progress.

Tsetse Flies.

Three specimens of *Glossina pallidipes* Austen, the first recorded in the Sudan, were sent by Dr. J. G. Myers from the Boma Plateau. This species is able to carry trypanosomes pathogenic to man.

Myiasis.

Many specimens of dipterous larvae from human and animal wounds were received, most of which were *Wohlfahrtia nuba* Wied. A notable exception was a collection of larvae of *Chrysomyia bezziana* Vill., the screw-worm fly, from a mule at Wad Medani, which had not been recorded before from the Sudan. Only two specimens of *Cordylobia anthropophaga* Grunb. were received.

Mollusca.

Two new records from the Sudan were *Planorbis gibbonsi* Nelson, and *Viviparus unicolor* Oliv. from the Gebel Aulia reservoir.

Insects from aircraft.

121 insects were received, collected in 43 aircraft. None were mosquitoes.

Tests of Insecticide.

Tests of sprays were made on *Aedes aegypti*.

Exhibits.

Specimens were supplied for teaching purposes and for Agricultural Shows.

Pit latrines.

Of 62 fly larvae taken from pit latrines in Khartoum and Omdurman only 3 per cent. were those of house flies.

REPORT ON THE WELLCOME CHEMICAL LABORATORIES FOR THE YEAR 1939.

(By Dr. A. J. Henry.)

The Wellcome Chemical Laboratories formed part of the Agricultural Research Institute, Department of Agriculture and Forests, until July, 1939 when they were transferred to the Sudan Medical Service. The following is a brief summary of the work carried out in the Laboratories during the past year.

The nature of the work of the Laboratories has been closely similar to that of recent years and 2,140 samples were received as compared with 1,880 in 1938. The samples, submitted by the various Government Departments and by private firms and individuals, represent a wide range of substances and of types of examinations required and the work of dealing with them has left no appreciable time available for research.

The samples received are grouped under the headings: waters; foodstuffs; medicolegal and miscellaneous drugs; mineralogical; miscellaneous; and cotton plant powders for nitrogen content. The following table gives the distribution of the samples under these headings:

Waters	443
Foodstuffs	581
Medicolegal and Miscellaneous Drugs	87
Mineralogical	160
Miscellaneous	281
Cotton Plant Powders	588

WATERS.

Two hundred and seventy of the samples received weer classed as potable waters. Periodical examinations of the supplies at Port Sudan, Tokar and El Obeid were carried out and a considerable number from the Blue Nile and from various wells in the Khartoum district, and from the provinces were examined.

FOODSTUFFS.

The monthly examination of Khartoum and district milk supplies in collaboration with the Medical Officer of Health accounts for 519 of the total. The remainder include alcoholic beverages, sugars, butters, various roots consumed by the natives, etc.

MEDICOLEGAL AND MISCELLANEOUS DRUGS.

Sixteen pathological specimens, associated with nine separate cases of which two were animals were examined. The positive findings were zinc in a vomit, *cannabis indica* (hashish) in a stomach content, and copper in post mortem specimens.

Forty nine specimens, classed as toxicological, were received in association with some of the above, and other, cases. A sample, known locally as Sakran and reputed to have been employed in an outbreak of alleged drugging with intent to rob, was Datura seeds.

Twenty two samples classified as miscellaneous drugs consisted of six medicinal preparations and sixteen suspected of containing prohibited drugs, of which four were opium, three hashish and two contained berberine.

MINERALOGICAL.

Under this heading are included coals examined for the Railways ; mineral oils and greases ; various metals, principally white metals ; cements ; soils ; salts of various types ; pigments ; limes and limestones ; etc.

MISCELLANEOUS.

Oil seeds of various sorts and methylated spirits account for a large proportion of the samples classified under this heading, while perfumes, textiles, soaps, samples received in connection with suspected counterfeiting of coins, etc. are also included.

COTTON PLANT POWDERS.

These were received from the Plant Physiologist for determination of nitrogen content.

PROGRESS OF WORK.

The work carried out at hospitals and dispensaries is becoming stabilised, and varies with the state of public health, but preventive medicine continues to develop as rapidly as funds will allow.

CURATIVE MEDICINE.

The following table shows the number of inpatients, outpatient attendances, and operations performed during the last ten years :—

YEAR.	Inpatients.	Outpatient Attendances.	Operations Performed.
1930	49,911	3,840,923	6,110
1931	59,736	4,044,439	6,798
1932	59,642	4,264,412	7,287
1933	70,315	5,092,999	8,609
1934	85,990	6,039,197	10,082
1935	89,093	6,112,303	11,124
1936	96,081	6,500,441	11,229
1937	101,088	6,675,989	12,063
1938	104,366	6.989,990	11,439
1939	105,103	7,119,973	11,253

The figures show a slight increase despite the temporary reduction in the work of certain hospitals owing to measures taken on the outbreak of war.

The programme of improving facilities in existing hospitals and dispensaries is progressing rapidly. Work has been commenced on the construction of a new hospital of 500 beds, including verandah accommodation, in Khartoum to replace two existing hospitals, one of which, the River Hospital, has been condemned, and one, the present Khartoum Civil Hospital, will be taken over as Headquarters Office. X-Ray facilities have been provided at Omdurman and El Obeid hospitals. The new hospital at Kosti of 110 beds, which replaces a smaller one owing to the replanning of that town as a result of the filling of the Jebel Aulia Reservoir, was nearly completed by the end of the year.

Approval has been obtained for improving the quarantine and laboratory accommodation at Port Sudan Hospital, and an extensive programme to provide additional accommodation and better operating facilities is in progress at Gedaref.

A large number of building proposals have been approved to be completed during the next three years, and on completion the hospital and dispensary buildings as a whole will be adequate for their purpose.

PREVENTIVE MEDICINE.

Continual progress is being made in this branch of medicine. Anti-malarial measures are constantly being improved and staff increased, and every effort is made to persuade the people to help themselves both as regards anti-malarial work and other public health problems. Piped, filtered water supplies have been inaugurated at Malakal and Wadi Halfa, and a supply is being installed at Kosti. The Atbara town supply has been brought up to modern standards. Village water supplies have been improved in many areas, and special attention is being paid to this problem in the Gezira as an anti-Bilharzia measure, and in the Southern Sudan as a preventive of Guinea worm.

Experiments are continually being carried out on sanitation and conservancy of large native lodging areas particularly in Khartoum and Port Sudan.

Special attention is being paid to housing, and an effort made to introduce a cheap standard of house of approved pattern to the conservative people of the central Sudan. Full use is made of propaganda at agricultural shows, and through the Graphic Museum as regards housing, welfare, diet, etc. Vegetable gardens are maintained at many hospitals and dispensaries, and by province authorities both as a source of supply and as an example to be followed. There are few better ways of introducing fruit and vegetables as a diet to a conservative population than in hospital rations. The Native Housing Committee, and the Nutrition Committee continue to serve a useful purpose.

LABORATORIES AND RESEARCH.

The local production of calf lymph rendered possible the vaccination of the population of Darfur Province during the year. The potency of the lymph remains at a surprisingly high level.

Investigations have been continued on the etiology of Kala-azar.

The Malariologist continued to carry out his investigations in the Gezira. the reservoirs of the Sennar and Gebel Aulia Dams, and Khartoum.

TRAINING

The Medical School course was slightly modified as the result of experience. Courses for public health officers, sanitary overseers, dispensers, medical assistants, hospital orderlies, midwives and nurses were organised during the year. A compulsory post graduate course of six months duration for graduates of the Kitchener School of Medicine commenced at Khartoum in October.

TRAINING.

Great importance is attached to the training of Sudanese medical, public health and laboratory staff as it is only by this means that it is possible to provide adequate facilities extending over the whole country with the funds available.

At present over 90% of the male classified officials of the Sudan Medical Service are Sudanese, and they hold eight posts which would otherwise be held by senior foreign officials. The training of women is not as far advanced but the Midwives' and Nurses' training schools are working to full capacity after a long uphill fight among the conservative women of the Sudan.

Courses are in being for the following categories of staff :—

Hospitals.	*Public Health.*	*Laboratories.*
Medical Officers	Public Health Officers	Laboratory attendants.
Dispensers	Sanitary overseers	
Asst. Radiographers	House to house inspectors	
Medical Assistants	Mosquito men	
Hospital orderlies	Midwives	
Female nurses		

POST GRADUATE TRAINING.

Two Sudanese doctors completed a three months course at the British Postgraduate School, London and four commenced a six months postgraduate course at Khartoum in October. The latter will be compulsory for graduates of the Kitchener School of Medicine approximately ten years after qualifying, unless they have already taken postgraduate courses outside the Sudan. This innovation promises to be of the greatest value in maintaining a high professional standard among the Sudanese doctors.

KITCHENER SCHOOL OF MEDICINE.

ANNUAL REPORT 1939.

(By Mr. J. S. Aldridge.)

STUDENTS.

No new students were admitted in 1939 to the Kitchener School. Prospective Medical students entered the Science School and will pass to the Medical School in 1941.

The classes were composed as follows :—

2nd Year	7
4th Year	8
Total	15

PROGRESS OF CLASSES.

Medicine Finals.

A Special Final Examination was held in Medicine in April. Mr. R. H. Bland was the External Examiner.

Dafalla Mustafa satisfied the Examiner and was recommended for the Diploma to practise Medicine in the Sudan.

Pathology and Public Health.

The Examinations in Pathology and Public Health were held at the end of the year. Dr. R. Kirk was the External Examiner in Pathology and Mr. A. E. Lorenzen in Public Health. The Examinations were carried out under the supervision of a " Visitor " from the Royal Colleges of Physicians and Surgeons who this year was Sir Adolphe Abrahams, O.B.E., M.D., F.R.C.P., Dean of the Westminster Hospital Medical School and Physician to Outpatients at the Westminster Hospital.

Eight candidates were examined and of these six were successful and will proceed to 5th year and two were referred until April, 1940 when they will be allowed to sit the examination in both subjects again.

The Jackson Prize in Pathology was awarded to Daoud Mustafa.

The Balfour Prize in Public Health was awarded to Mohamed Ali Ahmed.

TEACHING STAFF.

(a) Dr. R. M. Humphreys resigned from the lectureship in Forensic Medicine and Mr. A. E. Lorenzen was appointed as his successor.

(b) Miss E. Hills-Young who has held the post of Lecturer in Nursing was transferred and Miss A. V. Butcher was appointed in her place.

(c) Mr. D. R. Macdonald was appointed Lecturer in Applied Physiology and Mental Diseases respectively.

(d) Dr. L. T. Alianak was appointed Lecturer in Dental Diseases.

SYLLABUS OF THE SIX YEARS COURSE.

The present course consist of two years in the Science School where students are taught Chemistry, Physics, Biology and Arabic, English and Mathematics. They then pass to the Kitchener School and spend 18 months in Anatomy and Physiology followed by 2½ years in hospital practice.

POSTGRADUATE COURSE.

Four Medical Officers have started a six months course in Postgraduate Subjects.

HEALTH.

The health of the students was satisfactory.

LIBRARY.

45 new books were added during the year to the library which now contains 1,300 books. 310 books were borrowed by practitioners and students during the year.

STUDENTS' HOSTEL.

In addition to the Medical students, nineteen Science students and three Veterinary students were housed in the Hostel and received the same privileges as the Medical students.

GAMES.

Football, netball and tennis are played in the school and Hostel grounds.

Ten football matches were played with other teams.

MISSIONS.

The following table shows the work carried out by Medical Missions :—

	Inpatients.	Outpatient Attendances	Operations.
THE CHURCH MISSIONARY SOCIETY.			
Omdurman. (Khartoum Province)	1,283	79,608	239
Lui (Equatoria Province)	671	168,957	196
Zeraf Island (Upper Nile)	617	6,854	238
Sallara (Nuba Mountains)	199	10,229	—
	2770	265648	
THE SUDAN UNITED MISSION.			
Abri (Nuba Mountains)	86	2,932	—
Tabanya (Nuba Mountains)	—	1,515	—
Rom (Upper Nile Province)	27	3,680	—
		8127	
THE AMERICAN MISSION.			
Nasir (Upper Nile Province)	—	10,233	56
Doleib Hill (Upper Nile Province)	—	13,548	—
		23781	

STAFF.

SUDAN MEDICAL SERVICE 1939.

APPROVED BUDGETARY ESTABLISHMENT OF CLASSIFIED OFFICIALS.

Appointment.	Establishment
Headquarters.	
Director	1
Assistant Director (Public Health)	1
Assistant Director (Hospitals)	1
Head Staff Clerk	1
Staff Clerk	1
Clerks	22
Head Accountant	1
Accountant	1
Book-keepers	12
Head Storekeeper	1
A/Head Storekeeper	1
Storekeepers...	7
Hospitals.	
Senior Physician	1
Senior Surgeon	1
Gynaecologist	1
Ophthalmologist	1
Senior Medical Inspectors	33
Assistant Ophthalmologist	1
Medical Sub-Inspectors	4
Medical Officers	62
Medical Assistants	269
Matron	1
Matron, Nurses Training School	1
Charge Sisters	5
Nursing Sisters	10
Radiographer	1
Assistant Radiographers	3
Pharmacists	2
Dispensers	4
Bookkeepers...	50
Clerks	2
Head Hospital Orderlies	31
Theatre Attendants	24
Brought forward	557

Appointment	Establishment
Carried forward	557
Public Health.	
Medical Officer of Health	1
Assistant Medical Officer of Health	1
Chief Public Health Inspector	1
Senior Public Health Inspectors...	12
Public Health Officers	11
Public Health Overseers	77
Principal, Midwives Training School	1
Asst. Principal Midwives Training School	1
Staff Midwives	3
Research.	
Stack Medical Research Laboratories.	
Assistant Director (Research) and Senior Medical Research Officer	1
Bacteriologist	1
Assistant Bacteriologist	1
Laboratory Assistants (British)	4
Laboratory Assistants (Sudanese)	34
Junior Technical Assistants	2
Clerks	3
Medical Entomology.	
Medical Entomologist	1
Technical Assistants	2
Wellcome Chemical Laboratories.	
Government Analyst	1
Chemists	2
Technical Assistants	5
Junior Technical Assistants	2
Clerk	1
Kitchener School of Medicine.	
Registrar	1
Library Clerk	1
Graphic Museum.	
Assistant Curator	1
Museum Attendants	2
TOTAL	730

BRITISH MEDICAL STAFF.

SUDAN MEDICAL SERVICE
on 31.12.1939.

Director	Mr. E. D. Pridie, D.S.O., O.B.E., M.B., B.S., 3N.
Asst. Director (Public Health)	Mr. H. A. Crouch, O.B.E., M.C., M.R.C.S., L.R.C.P. D.P.H., 3N.
Asst. Director (Hospitals)	Mr. N. MacLeod, M.B., ch.B., 4N.
Registrar, School of Medicine	Mr. J. S. Aldridge, M.R.C.S., L.R.C.P.

SPECIALIST APPOINTMENTS.

Senior Physician	Dr. R. M. Humphreys, D.M., B.ch., 4N.
Senior Surgeon	Mr. F. S. Mayne, M.B., F.R.C.S.E.
Obstetric Surgeon and Gynaecologist	Mr. J. S. Hovell, M.B., F.R.C.S.E., M.R.C.O.G.
Ophthalmic Surgeon	Mr. A. R. McKelvie, M.B., ch.B., D.O., D.O.M.S.
Medical Officer of Health	Mr. A. E. Lorenzen, M.R.C.S., L.R.C.P., D.P.H., 4N.

MEDICAL SECTION.

Senior Medical Inspector	Dr. A. Cruickshank, M.D., B.ch., 4.N.
,, ,, ,,	Mr. C. E. G. Bevridge, M.R.C.S., L.R.C.P., 4N.
,, ,, ,,	Mr. F. H. Goss, M.C., M.B., B.ch.
,, ,, ,,	Dr. L. H. Henderson, M.D., ch.B., D.T.M. & H.
,, ,, ,,	Mr. D. R. Macdonald, M.B., ch.B.
,, ,, ,,	Mr. E. P. Pratt, M.B., B.S.
,, ,, ,,	Mr. G. D. Rankin, M.B., B.ch.
,, ,, ,,	Mr. H. M. Elliott, M.B., B.ch.
,, ,, ,,	Dr. J. Bryant, M.D., ch.B., F.R.C.P.E., D.T.M. & H.
,, ,, ,,	Mr. C. B. Drew, M.R.C.S., L.R.C.P.
,, ,, ,,	Mr. E. W. T. Morris, F.R.C.S.
,, ,, ,,	Mr. H. M. Woodman, M.B., B.ch.
,, ,, ,,	Mr. A. P. Farmer, M.B., B.S., D.T.M. & H.
,, ,, ,,	Dr. N. L. Corkill, M.M., M.D., ch.B.
,, ,, ,,	Mr. G. J. Clarke, M.R.C.S., L.R.C.P., D.T.M. & H.
,, ,, ,,	Mr. L. Brown, M.R.C.S., L.R.C.P.

MEDICAL SECTION—*Contd.*

Senior Medical Inspector	Dr. R. McN. Buchanan, M.D., ch.B. D.T.M. & H.
,, ,, ,,	Mr. H. Richards, M.B., B.S., D.T.M. & H.
,, ,, ,,	Mr. E. K. Malone, M.B., B.ch., B.A.O.
,, ,, ,,	Mr. J. L. D. Roy, M.B., ch.B.
,, ,, ,,	Mr. F. Bartholomew, F.R.C.S.E.
,, ,, ,,	Mr. R. W. Stephenson, M.R.C.S., L.R.C.P.
,, ,, ,,	Mr. F. L. Wheaton M.B., B.S.
,, ,, ,,	Mr. J. F. E. Bloss, M.R.C.S., L.R.C.P., D.T.M. & H.
,, ,, ,,	Mr. W. H. Greany, M.B., B.ch.
,, ,, ,,	Mr. A. Royland Hunt, L.R.C.P., L.R.C.S. (Ed.).
Medical Inspector	Mr. R. B. U. Somers, M.B., ch.B., D.T.M. & H.
,, ,,	Mr. W. F. Townsend Coles, M.B., B.S.
,, ,,	Mr. R. T. Campbell, M.B., ch.B.
,, ,,	Mr. H. D. Fairman, M.B., B.S.
,, ,,	Mr. C. A. Lewis, M.R.C.S., L.R.C.P.
,, ,,	Mr. E. O'D. C. Grattan, M.B., B.ch. F.R.C.S.
,, ,,	Mr. G. F. E. Ramsden, M.B., ch.B.

STACK MEDICAL RESEARCH LABORATORIES.

Asst. Director Laboratory Services	Dr. E. S. Horgan, B.A., M.D., B.ch., B.A.O.
Bacteriologist	Dr. R. Kirk, M.D., ch.B., B.SC., F.R.F.P.S.G., D.P.H.

FINANCIAL.

The following figures show the actual Revenue and Expenditure of the Sudan Medical Service for the last three years :—

	1937	1938	1939
	£E.	£E.	£E.
1. Revenue	44,800	45,219	41,954
2. Expenditure :			
Chapter 1. Personnel and Personal Allowances	162,510	168,582	175,562
Chapter 2. Services	102,212	111,569	106,382
Chapter 3. Extraordinary Expenditure	7,328	3,479	3,787
TOTAL .... £E.	272,050	283,630	285,731

TABLE I.

ADMISSIONS AND DEATHS.

BY DISEASES.

	Darfur		Equatoria		Gezira		Kassala		Khartoum		Kordofan		Northern		Upper Nile		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1. T. B. Pulmonary	13	4	101	16	144	27	107	15	130	39	64	20	105	11	21	5	685	137
2. T. B. Non-Pulmonary	27	7	44	3	117	8	44	1	25	—	67	6	53	3	19	2	396	30
3. Syphilis	5,151	7	4,706	6	804	11	381	1	389	2	4,954	9	385	—	910	—	17,680	36
4. Gonorrhoea	240	1	934	3	470	1	356	—	431	—	436	3	314	1	310	—	3,491	9
5. Soft Sore	76	—	23	—	56	—	39	—	36	—	63	—	21	—	16	—	330	—
6. Trachoma	128	—	848	—	84	—	27	—	48	—	82	—	148	—	3	—	1,368	—
7. All other eye diseases	304	—	776	—	272	—	188	—	776	—	269	—	371	—	398	—	3,358	—
8. Ear	50	—	143	2	54	—	10	—	33	—	90	—	16	—	17	—	413	2
9. Skin	182	2	832	1	209	3	97	—	239	—	517	2	160	—	89	1	2,325	9
10. Wounds and other injuries ...	2,067	19	6,512	55	2,096	46	1,394	30	978	15	3,416	50	1,189	17	581	10	18,233	242
11. Tumours Malignant	25	6	14	1	51	10	13	3	65	11	48	5	17	3	3	1	236	40
12. Tumours Non-Malignant ...	111	—	60	1	93	—	38	—	95	—	49	—	25	—	22	—	493	1
13. Gynaecological	24	1	32	—	195	1	77	2	302	3	128	3	110	—	27	2	895	12
14. Confinements	18	—	29	1	122	10	73	2	274	14	91	7	70	5	17	2	694	41
15. Poisoning	22	1	15	—	64	4	22	1	8	1	6	—	13	—	1	—	151	7
16. Ancylostomiasis	7	—	1,855	32	34	—	19	—	14	—	3	—	67	—	69	1	2,068	33
17. Bilharziasis	68	—	715	15	199	4	13	—	42	—	333	1	105	—	43	—	1,518	20
18. Blackwater Fever	1	1	4	2	5	2	1	—	2	—	4	1	2	1	1	—	20	7
19. Dysentery, Amoebic	822	6	545	16	345	27	436	5	227	3	534	21	278	—	160	13	3,347	91
20. Dysentery, Bacillary	2	1	22	5	33	3	24	—	39	1	56	4	5	—	—	—	181	14
21. Filariasis	8	—	52	3	2	—	—	—	2	—	4	—	—	—	1	—	69	3
22. Madura disease	20	—	1	—	108	—	18	—	64	—	45	—	27	—	1	—	284	—
23. Malaria	489	1	771	6	2,693	28	658	3	1,368	17	1,868	15	906	11	640	7	9,393	88
24. Leishmaniasis	14	6	72	5	193	53	58	16	9	3	1	1	1	—	46	20	394	104
25. Trypanosomiasis	—	—	109	3	—	—	—	—	—	—	—	—	—	—	—	—	109	3
26. Yaws	7	—	3,411	6	3	—	—	—	—	—	—	—	—	—	91	—	3,518	6
27. Heat Stroke	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	2	—
28. Guinea Worm	21	—	524	1	10	1	5	—	—	—	150	—	—	—	50	—	760	2
29. Tropical Ulcer	362	—	2,937	3	192	—	40	—	12	—	927	1	—	—	179	—	4,649	4
30. Anthrax	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31. Cerebrospinal Meningitis ...	2	2	583	66	14	7	4	1	55	13	17	11	5	1	—	—	680	101
32. Chickenpox	35	—	38	—	59	—	39	—	67	—	166	—	53	—	74	—	531	—
33. Dengue	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
34. Diphtheria	—	—	—	—	7	2	17	1	23	3	8	3	17	2	1	—	73	11
35. Enteric Fever	1	1	10	1	36	1	12	2	84	11	3	—	52	3	4	1	202	20
36. Erysipelas	1	—	1	—	10	—	1	—	—	—	4	1	3	—	—	—	20	1
37. Gastro enteritis of children ...	2	2	18	5	5	2	11	3	23	3	35	4	2	1	10	1	106	21
38. Influenza	101	1	123	—	9	—	53	1	54	—	124	1	86	—	23	—	573	3
39. Leprosy	7	2	126	10	33	—	9	—	23	—	48	2	5	1	12	—	263	15
40. Undulant Fever	—	—	—	—	18	1	4	—	1	—	2	—	1	—	3	—	29	1
41. Measles	20	—	315	2	53	—	10	—	10	—	196	2	16	—	109	1	729	5
42. Mumps	117	—	4	—	43	—	49	—	8	—	117	—	12	—	3	—	353	—
43. Pellagra	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	2	—
44. Puerperal Fever	4	—	2	—	10	—	2	—	1	—	6	—	4	2	—	—	29	2
45. Phlebotomus Fever	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13	—
46. Pneumonia	101	20	348	44	374	44	204	36	229	54	171	42	162	25	44	5	1,633	270
47. Rabies	14	1	—	—	4	4	2	—	1	1	1	1	2	1	1	—	25	8
48. Relapsing Fever	46	6	—	—	256	20	117	6	102	3	72	8	21	—	—	—	614	43
49. Acute Rheumatism	103	—	12	1	18	1	50	—	29	1	37	—	49	1	5	—	303	4
50. Smallpox	39	5	1	—	7	—	—	—	2	—	2	1	—	—	—	—	51	6
51. Tetanus	2	1	1	—	9	2	1	—	4	—	3	2	—	—	3	1	23	6
52. Whooping Cough	3	—	1	—	16	1	1	—	14	1	29	1	3	—	—	—	67	3
53. Circulatory System	67	11	277	9	207	24	133	22	259	36	160	19	137	12	15	4	1,255	137
54. Respiratory System	119	2	915	26	598	31	373	3	439	11	782	50	334	9	188	7	3,748	139
55. Alimentary System	283	14	921	35	1,069	92	401	19	874	38	1,252	53	505	13	201	19	5,506	283
56. Genito-Urinary Sytem ...	82	5	281	—	373	19	157	11	283	19	345	23	191	15	41	—	1,753	92
57. Nervous System	31	3	65	4	100	15	50	4	102	7	101	7	64	1	18	1	521	42
58. Scurvy	1	—	2	—	151	6	10	—	1	—	20	—	—	—	4	1	189	7
59. Diabetes	3	—	4	—	35	3	11	—	86	—	12	3	27	2	1	1	179	9
60. Fever of uncertain origin ...	102	6	349	1	428	23	369	17	247	9	96	10	194	5	18	—	1,803	71
61. All other diseases	334	8	2,536	26	808	14	558	22	855	47	621	11	429	3	629	1	6,770	132
Total	11,892	153	33,020	416	13,399	551	6,787	227	9,484	366	18,636	404	6,763	149	5,122	107	105,103	2,373

TABLE II.

OUT-PATIENTS

NEW CASES BY DISEASES

and

TOTAL ATTENDANCES.

		Darfur	Equatoria	Gezira	Kassala	Khartoum	Kordofan	Northern	Upper Nile	TOTAL
1.	T. B. Pulmonary	44	56	234	151	209	62	252	26	1,034
2.	T. B. Non-Pulmonary	168	19	121	122	56	67	44	41	638
3.	Syphilis	16,089	5,335	12,782	4,871	3,740	20,895	3,683	11,484	81,879
4.	Gonorrhoea	872	1,341	2,473	2,446	1,609	1,700	971	839	12,251
5.	Soft Sore	654	33	422	695	277	307	4,269	206	6,863
6.	Trachoma	3,985	5,081	32,592	16,937	17,917	3,426	37,919	901	118,758
7.	All other eye diseases....	6,087	19,161	43,673	19,468	21,822	17,137	28,870	9,318	165,536
8.	Ear	1,727	5,158	11,685	7,173	5,555	5,256	8,524	1,512	64,590
9.	Skin	6,864	16,119	8,521	2,846	3,159	14,318	8,812	3,495	64,134
10.	Wounds and other injuries	23,265	95,774	146,556	89,579	119,531	59,999	43,712	10,905	589,321
11.	Tumours Malignant	66	—	204	100	156	52	32	9	619
12.	Tumours Non-Malignant	900	25	3,776	1,101	1,460	401	657	94	8,414
13.	Gynaecological	25	4	348	186	1,370	295	228	28	2,484
14.	Confinements	4	4	74	27	366	52	296	23	846
15.	Poisoning	21	23	95	—	62	10	19	5	235
16.	Ancylostomiasis	322	2,379	45	46	39	7	625	70	3,533
17.	Bilharziasis	658	857	1,764	125	1,002	3,425	2,343	100	10,274
18.	Blackwater Fever	4	4	1	2	2	2	1	1	17
19.	Dysentery, Amoebic	2,434	1,361	8,016	3,918	2,856	2,559	3,872	1,276	26,292
20.	Dysentery, Bacillary	41	—	400	278	384	153	253	—	1,509
21.	Filariasis	3	48	3	1	—	4	—	1	60
22.	Madura disease	10	20	720	26	98	29	18	1	922
23.	Malaria	4,012	5,764	56,830	9,237	11,606	30,449	16,863	4,660	139,421
24.	Leishmaniasis	9	108	1,723	22	9	3	—	47	1,921
25.	Trypanosomiasis	—	56	—	—	—	—	—	—	56
26.	Yaws	279	23,309	—	—	—	4	—	417	24,009
27.	Heat Stroke	—	—	34	—	—	—	4	—	38
28.	Guinea Worm	287	2,368	297	6	—	470	—	168	3,595
29.	Tropical Ulcer	1,096	19,148	781	1,043	15	3,242	189	3,504	29,012
30.	Anthrax	—	—	—	—	—	—	—	—	—
31.	Cerebrospinal Meningitis	1	236	55	4	18	15	3	2	334
32.	Chickenpox	67	14	168	31	83	234	157	92	846
33.	Dengue	4	—	—	—	1	—	—	—	5
34.	Diphtheria	4	—	6	27	18	6	8	4	73
35.	Enteric Fever....	1	—	—	3	36	—	27	10	77
36.	Erysipelas	—	—	1	2	11	3	7	—	24
37.	Gastro enteritis of children	228	326	1,064	192	2,189	893	1,071	44	5,907
38.	Influenza	1,083	1,155	1,835	2,396	2,183	233	1,923	53	10,861
39.	Leprosy	72	251	78	8	13	124	6	18	570
40.	Undulant Fever	—	—	3	1	1	1	—	3	9
41.	Measles	36	346	1,050	74	319	663	763	282	3,633
42.	Mumps	261	12	736	172	765	293	502	27	2,768
43.	Pellagra	—	—	—	4	—	4	—	—	8
44.	Puerperal Fever	1	—	40	41	22	7	55	1	131
45.	Phlebotomus Fever	—	—	16	92	1	—	46	—	155
46.	Pneumonia	153	206	1,101	321	376	287	804	97	3,345
47.	Rabies	17	—	26	51	7	10	5	3	119
48.	Relapsing Fever	43	—	457	81	116	15	220	—	932
49.	Acute Rheumatism	585	92	1,099	1,561	1,465	301	1,558	107	6,768
50.	Smallpox	76	—	11	—	6	3	—	2	98
51.	Tetanus	1	—	2	—	2	2	—	3	10
52.	Whooping Cough	25	74	1,239	212	1,226	544	853	59	4,232
53.	Circulatory System	141	92	2,086	1,902	1,623	1,023	1,636	275	8,778
54.	Respiratory System	6,944	42,039	42,336	28,390	14,353	29,131	31,976	5,167	200,336
55.	Alimentary System	18,127	22,278	65,621	36,296	25,805	36,993	47,444	5,110	257,674
56.	Genito-Urinary System	1,689	57	7,251	1,533	2,092	2,055	2,285	83	17,045
57.	Nervous System	39	14	3,478	1,702	1,464	1,157	3,212	220	11,286
58.	Scurvy	1	—	403	61	7	37	26	60	595
59.	Diabetes	2	1	816	45	94	27	128	—	1,113
60.	Fever of uncertain origin	1,592	2,364	20,208	7,641	6,553	4,240	7,734	998	51,330
61.	All other diseases	9,410	15,981	113,814	23,643	28,767	15,608	32,098	4,555	243,876
Total New Cases	....	110,529	289,178	599,170	269,856	282,918	258,234	297,003	66,406	2,173,294
ATTENDANCES :	MEN	155,827	378,645	689,358	422,274	300,701	447,590	408,195	90,022	2,892,612
	WOMEN	74,684	174,572	270,842	94,934	192,895	231,357	244,069	50,364	1,333,717
	CHILDREN	90,164	193,633	434,841	160,769	237,089	380,301	536,428	57,859	2,091,084
ATTENDANCES :	DRESSING STATIONS	—	254,594	—	74,069	197,523	—	240,374	—	766,560
Total Attendances	....	320,675	1,001,444	1,395,041	752,046	928,208	1,059,248	1,429,066	198,244	7,119,973

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